

EMERGING TRENDS IN LIBRARY AND INFORMATION SERVICES

BS(LIS)

Code No. 9217

Units: 1-9



Department of Library and Information Sciences
Faculty of Social Sciences and Humanities
ALLAMA IQBAL OPEN UNIVERSITY
ISLAMABAD

BS Library and Information Sciences

Emerging Trends in Library and Information Services

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**Department of Library and Information Sciences
Allama Iqbal Open University, Islamabad**

COURSE TEAM

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FOREWORD

Department of Library and Information Sciences was established in 1985 under the flagship of the Faculty of Social Sciences and Humanities intending to produce trained professional manpower. The department is currently offering seven programs from certificate course to PhD level for fresh and/or continuing students. The department is supporting the mission of AIOU keeping in view the philosophies of distance and online education. The primary focus of its programs is to provide quality education through targeting the educational needs of the masses at their doorstep across the country.

BS 4-year in Library and Information Sciences (LIS) is a competency-based learning program. The primary aim of this program is to produce knowledgeable and ICT-based skilled professionals. The scheme of study for this program is specially designed on the foundational and advanced courses to provide in-depth knowledge and understanding of the areas of specialization in librarianship. It also focuses on general subjects and theories, principles, and methodologies of related LIS and relevant domains.

This new program has a well-defined level of LIS knowledge and includes courses of general education. The students are expected to advance beyond their higher secondary level and mature and deepen their competencies in communication, mathematics, languages, ICT, general science, and array of topics social science through analytical and intellectual scholarship. Moreover, the salient features of this program include practice-based learning to provide students with a platform of practical knowledge of the environment and context, they will face in their professional life.

This program intends to enhance students' abilities in planning and controlling library functions. The program will also produce highly skilled professional human resources to serve libraries, resource access centers, documentation centers, archives, museums, information centers, and LIS schools. Further, it will also help students to improve their knowledge and skills of management, research, technology, advocacy, problem-solving, and decision-making relevant to information work in a rapidly changing environment along with integrity and social responsibility. I welcome you all and wish you good luck for your academic exploration at AIOU!

Prof. Dr. Zia Ul-Qayyum
Vice-Chancellor

PREFACE

Libraries are universally recognized as important social institutions and no community is considered complete without a library system. However, libraries are facing change due to the impact of ICT, changing user needs, changing information environment or Web/Google that is trying to replace Reference Librarians. The use of Disruptive technologies is resulting in a transition from Print to Digital, Changes take place from Forms to Formats, Delivery systems, and it is inevitable.

There is a transformation in the need of library users' and due to ICT, there is a change in the resources, services and products of the libraries. Every institution is now trying to compete in the national and international rankings and with the changing roles and services; the libraries and librarians are playing a key role. People are thinking that the role and prospects of library professionals are decreasing, rather we can say that they are becoming more important provided they are keeping pace with emerging trends & technologies in LIS and are willing to adopt these technologies.

This course is developed with the purpose to impart knowledge regarding emerging trends and technologies in library and information services like Library Automation, Digitalization, Institutional Repository and Digital Library Services, Consortia based Services, QR Code, EM and RFID implementation, Open Access, Outreach programs, Reference Management, Open Science, Virtual/Digital Reference Services, Ask the Librarian, Content Management, CAS/SDI services, Profiling System, Discovery Services, Web 2.0 and 3.0 based Services, Use of Social Media, Green Library Concept, to help in Ranking/Accreditation, Remote Login, Cloud computing, Mobile based Library Services, Use of Expert Systems and Robotics, Internet of Things, Augmented Reality Tools and Virtual Reality Tools, Semantics, Artificial Intelligence and Machine learning and How to be a Smart Librarian by Smart Involvements etc.

Prof. Dr Syed Hassan Raza
Dean Faculty of Social Sciences and Humanities

ACKNOWLEDGEMENTS

All praise to Almighty Allah who has bestowed me the potential and courage to undertake this work. Prayers and peace be upon our Prophet Hazrat Muhammad, his family and all of his faithful companions.

I am thankful to the worthy Vice-Chancellor and the worthy Dean, FSSH for allowing me to prepare this study guide. Without their support, this task may not be possible. Further, they have consistently been a source of knowledge, inspiration, motivation, and much more.

I am highly indebted to my parents, spouse, siblings, and children, who allowed me to utilize family time in the completion of this work timely. Their continuous prayers kept me consistent throughout this journey. I would also appreciate the cooperation of my departmental colleagues extended to me whenever required. Special thanks to the Academic Planning and Course Production (APCP) and Editing Cell of AIOU for their valued input that paved my path to improve and finish this study guide following AIOU standards and guidelines. They have been very kind and supportive as well.

I would also like to thank the Print Production Unit (PPU) of AIOU for their support concerning the comprehensive formatting of the manuscript and for designing an impressive cover and title page. Special thanks are also owed to AIOU's library for giving me the relevant resources to complete this task in a befitting manner. I am also thankful to ICT officials for uploading this book to the AIOU website. There are many other persons, whose names I could not mention here, but they have been a source of motivation in the whole extent of this pursuit.

Muhammad Jawwad

Course Coordinator

INTRODUCTION

The library is a place where reading material is kept in an organized way to provide information services to users. For decades now libraries have been attuned to new developments in information technology and adopted them to enhance their collections and serve their communities. The latest trend in library and information science includes advances in collection management, user engagement, and security. This course is specifically designed for the students to look in dept in these three areas of library services and functions.

Libraries are already well on their way to increasing the percentage of their collections that are digital and available remotely. The library's role is a vital community resource, with some libraries working with local social service organizations to assist their patrons with issues such as food security, job searches, substance abuse, mental health care, and housing. Of course, technology will continue to be an important part of future libraries, due in part to the expansion of augmented reality and artificial intelligence. While many people now interact with chatbots online when they need help, expect to see a move towards incorporating actual robotics into library systems.

Libraries have already played a significant role in creating digital equity. through such opportunities as expanded computer labs for those who can't afford to buy their machines, the provision of WiFi signals that offer 24/7 free internet access to the surrounding area and offering both physical and virtual job and employment resources. These new trends in library and information science translate into ever-increasing access to greater amounts of information for everyone, and more and better ideas as to what can be done with that information.

OBJECTIVES

After completion of this course, you will be able to:

1. to enhance professional competence and skills.
2. to engage in collaborative teamwork.
3. in taking library and information services beyond the four walls of the libraries.
4. to use ICT tools for effective user services.
5. to produce need-based instructional materials for the users.
6. to discover new areas of research and enquiry in the field of library and information science.
7. to explore the application of Machine Learning, Artificial Intelligence and other technologies to serve the library community.
8. To identify New Roles for LIS Professionals to Survive in the Changed LIS Environment.

RECOMMENDED READINGS:

1. Ashraf, T., Sharma, J., & Gulati, P. A. (2010). *Developing sustainable digital libraries: Socio-technical perspectives*. Hershey: Information Science Reference.
2. DSpace 5.x documentation (2015). Retrieved November 15, 2015, from <https://wiki.duraspace.org/display/DSDOC5x>

COURSE ORGANIZATION

The course has been designed as easy as possible for distance mode of learning and it will help students in completing their required course work. The course is of three credit hours and comprises nine units, each unit starts with an introduction which provides an overall overview of that particular unit. At the end of every unit, the objectives of the unit show student the basic learning purposes. The rationale behind these objectives is that after reading the unit a student should be able to explain, discuss, compare, and analyze the concepts studied in that particular unit. This study guide is specifically structured for students to acquire the skill of self-learning through studying prescribed reading material. Studying all this material is compulsory for successful completion of the course. Recommended readings are listed at the end of each unit. Few self-assessment questions and activities have also been put forth for the students. These questions are meant to facilitate students in understanding and self-assessment that how much they have learned.

For this course, a 3-days workshop at the end of the semester, and four tutorial classes/meetings during the semester will be arranged by the department for learning this course. Participation/attendance in the workshop is compulsory (at least 70%). The tutorial classes/meetings are not formal lectures as given in any formal university. These are meant for group and individual discussions with tutors to facilitate students learning. So, before going to attend a tutorial, prepare yourself to discuss course contents with your tutor (attendance in tutorial classes/meetings is non-compulsory).

After completing the study of the first 5 units ‘Assignment No. 1’ is due. The second assignment that is ‘Assignment No. 2’ is due after the completion of the next 4 units. These two assignments are to be assessed by the relevant tutor/resource person. Students should be very careful while preparing the assignments because these may also be checked with Turnitin for plagiarism.

Course Study Plan and Chart

As you know the course is offered through distance education, so it is organized in a manner to evolve a self-learning process in absence of formal classroom teaching. Although the students can choose their-way of studying the required reading material, but advised to follow the following steps:

- Step-1:** Thoroughly read the description of the course for clear identification of the reading material.
- Step-2:** Read carefully the way the reading material is to be used.
- Step-3:** Complete the first quick reading of your required study materials.

Step-4: Carefully make the second reading and note down some of the points in a notebook, which are not clear and need full understanding.

Step-5: Carry out the self-assessment questions with the help of study material and tutor guidance.

Step-6: Revise notes. It is quite possible that many of those points which are not clear and understandable previously become clearer during the process of carrying out self-assessment questions.

Step-7: Make a third and final reading of the study material. At this stage, it is advised to keep in view the homework (assignments). These are compulsory for the successful completion of the course.

Assessment/Evaluation Criteria of Students' Coursework

As per AIOU's policy.

Note: Assignments submission and getting pass marks is compulsory, the student who will not submit assignments or is marked as fail is considered FAIL in the course. He/she will need to get fresh admission in the course.

Muhammad Jawwad
Course Coordinator

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UNIT-1

LIBRARY AND INFORMATION SCIENCE PROFESSION: TRENDS AND ISSUES

Compiled by: **Muhammad Jawwad**

Reviewed by: **Dr Amjid Khan**

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INTRODUCTION

This unit is developed to teach students how Library and Information Science (LIS) Profession has emerged as a profession and what is the historical background of digital transformation. What are the various issues faced and facing by the LIS profession and professionals? How technological change is emerging in society. The unit will also outline the impact of ICT on the LIS profession and current global trends and challenges faced by the LIS profession.

OBJECTIVES

After studying this unit, you will be able to understand:

- Library and Information Science (LIS) as a profession.
- Developments in digital transformation.
- Various issues are faced by the LIS profession and professionals.
- Current Global Trends in LIS.
- Challenges and opportunities available to LIS professionals.

1.1 INTRODUCTION

Library and Information Science is a profession that is full of people passionate about making a positive change in the world, and they tend to be wildly happy about what they do. Librarians bridge the gaps that exist between people, information and technology. In their professional lives, librarians and information professionals work to:

- Design and develop knowledge-organization systems.
- Create reader's advisory resources to encourage young students to develop a lifelong love of reading and learning.
- Help scholars locate archival and other resources crucial to their work.
- Identify sources of assistance in family and personal crises
- Help doctors more quickly locate health information in critical situations.

In the current era of digitization, we are living in the age of information explosion, where information is the subject of study and the focus of many disciplines and professions. Biology, for example, is concerned with information (among other things) when it studies the laws of genetics, and so is mass communication, which chooses a discipline at the other end of the academic spectrum, when it examines the messages circulating in the media. Information is an ever-present facet in the life experience of human beings as individuals and also of human societies as a whole. People constantly exchange information with each other as part of their vital interaction with their fellow man. Society deals with huge amounts of information permanently and in real-time, including, for example, city traffic and pollution data.

What exactly is the focus of interest of LIS in this overwhelming panorama presided over by the constant exchange of information? We can recognize several characteristics that are at the same time unique and exclusive to the information that concerns us in the field of LIS. First, LIS does not concern itself with just any kind of information, as we have been at pains to illustrate with the previous examples; rather, it concerns itself with information that is recorded in material supports, which we can refer to as documents. For many years now LIS has not only focused its attention on printed documents and textual information. As mentioned, the concept of the document includes any kind of recorded material including digital support and all types of information morphology, including text, image, video and sound. This means that LIS is not only concerned with monographs and articles in print magazines housed in libraries but also with computer records hosted in database systems.

Second, LIS does not concern itself with administrative information, such as that produced daily by millions of businesses and individuals around the globe, which means the balance sheets of a country's companies are not to be found in libraries; rather, we have to visit the company archives or the nation's historical archives (if the information is old) to find them.

The information that LIS does concern itself with, therefore, is what we might call cognitive information. This class of information, in contrast with administrative information, is to be found in the monographs and magazines acquired, catalogued, and made available to the general public in centers such as libraries, as well as by the compilers of databases and other organizations in the world of LIS. What is important for us is that the LIS profession needs to make full use of the intellectual and technological tools.

1.2 WHAT IS LIS?

Library and Information Science (LIS) is an interdisciplinary field of study that centers on the documentation that records our stories, memory, history, and knowledge. LIS professionals serve as custodians of printed materials, records, photographs, audiovisual materials, and ephemera, in both analogue and digital forms. Librarians and other information professionals collect, organize, preserve, and provide access to these materials and are the stewards of the knowledge that they contain. We connect people to the resources that they need to understand their histories, communities, and the world around them. We advocate for free and open access to these resources and train folks to use these materials to better themselves and society as life-long learners.

LIS professionals work in public libraries, school libraries, college and university libraries, corporate libraries, law libraries, medical libraries, special collections, historical societies, community archives, museums and galleries, non-profits, corporations, or anywhere that there is a need to collect, organize, and access documents and information resources. Libraries are viewed as important information sources and resources for people seeking mission-oriented information. It also serves as a professional service provided by librarians in helping many business originators, researchers, students as well as educators in finding, accessing and utilizing information resources to the fullest extent, especially concerning electronic resources.

1.3 LIS AND TECHNOLOGICAL CHANGE IN SOCIETY

Developments in ICT have brought about the merger of the computing, information, Communications, entertainment, and mass media industries thereby providing a means of exchanging information anytime, anywhere in the digital format used by computers. This technological convergence has brought about an enormous impact on the way we live, work, think and play. These changes are quite prevalent in our everyday lives such as the use of e-mail and cellular phones at home and the workplace and also linked to all facets of society: business, education, military, recreation, transportation, communication, scientific exploration, knowledge management, etc.

According to UNESCO (1961), there will always be changes in the environment, and these changes will affect librarians and information professionals in terms of their role, job opportunities, self-image, motivation and even survival. Librarians and information experts, therefore, need to move with these environmental changes and trends through timely repositioning and role claiming. This is simply because we are now living in an information society where the development of information and communication technology and telecommunication networks are changing the operation and skills required in all professions and the information profession is no exemption. The current technological era is accompanied by a corresponding increase in knowledge and skills with the rapid growth of information sharing. This new library and information science environment require new skills, products, equipment and platforms for seeking, processing and disseminating information. ICT has changed the nature of academic libraries. A variety of terms such as hybrid, digital and virtual library are used to refer to the library. A digital library can be defined as a “Managed collection of information with associated services where the information is stored in digital format and accessible over a network”. The virtual library has been defined as “Remote access to the content and services of libraries and other information resources, combining an on-site collection of current heavily used materials both print and in electronic form with an electronic network which provides access to and delivers from the external worldwide library and commercial information and knowledge sources. Hybrid libraries are libraries that provide access to both electronic resources and paper-based resources”. From the definitions, it is clear that most of today’s libraries fall in the hybrid category. The internet has made information access and retrieval both simple and complex. Information retrieval systems are being designed to suit the need of end users and therefore try to simplify the process. Simultaneously however the user is overwhelmed with so many information resources and choices that the process becomes complex. Following is the major shift in the current digital era:

- ICT made information creation in a digital format possible.
- ICT made online access and file transfer possible.
- ICT made networking and sharing of information resources possible.

The shift from print to digital information has a high impact on libraries, information centres and other institutions directly involved in processing information. This shift is generally attributed to the merging of computing, telecommunications technologies, and other industries. Computers have permeated society because of their ability to perform high volume error-free repetitive tasks at speeds much faster than human beings, while recent and emerging developments in the area of computing; telecommunications, networking and resource sharing made access to information anytime, anywhere possible.

With the developments and application of ICT, the whole scenario of libraries has changed. There is a shift from traditional libraries to hybrid libraries. We see the emergence of libraries with different nomenclatures operating in the universe of knowledge. These libraries are automated, electronic libraries, digital libraries or ubiquitous virtual libraries. In the web environment, there has emerged the concept of Library 2.0. All these libraries are using different information technology applications for performing activities ranging from the acquisition of materials to the dissemination of information.

The computer and IT has brought a new impact on library services and information usage. In libraries, ICT has assisted library and information science professionals to provide value-added services and give more remote access to available information resources. Information and communication technologies provide faster retrieval of stored information and reform our traditional library into a modern library. Recent ICT is impacting various facets of libraries and the information profession. Advancements in ICT and the widespread use of ICT are resulting in digital information sources and digital media replacing and becoming the dominant form of information storage and retrieval. Information and communication technology also survives and makes true rules of Library Science “Every reader his/her book/information”, “Save the time of the reader”, and “Library is a growing organism”. Information and communication technology with its great information sources, fast transmission speed, and easy access guarantees the satisfaction of the user with multifaceted demand, overcomes the distance barrier and reduced the time required and guarantees the right information to the right reader at the right time. It also rises and resolves the library’s demand for collection development. It is an outstanding tool for information centres or libraries.

ICT has created complex challenges for librarians or LIS professionals they have to redesign their positions to meet evolving needs. Librarians or LIS Professionals have to manage the change by adopting the latest ICT, thereby improving performance. They need to improve their skills and knowledge of new information and communication technologies to provide quality library services.

In the present dynamic turbulent World, the role of the librarian is accepting new information & communication technologies, information resources, and users’ demands. Librarian is responsible not only to provide traditional library information services but also to fast deliver online/offline information services according to the actual user’s needs. The librarian needs to keep up with their users’ demands to survive and service them. The librarian needs to become information knowledge navigators who distil data into usable information. Today, the Librarian has to play multiple evolving and expanding roles to face many new challenges in the dynamic ICT environment as follows:

- Librarian as a leader
- Librarian as a two-way communicator
- Librarian as an identifier
- Librarian as an information collector
- Librarian as an information organizer
- Librarian role in information retrieval
- Librarian as a website designer
- Librarian as an information analyst
- Librarian as a researcher
- Librarian as a knowledge manager
- Librarians as an information scientist in electronic/digital libraries
- Librarians as e-resource managers
- Librarian as an information disseminator.

1.4 DIGITAL TRANSFORMATION IN LIBRARIES

The basic principle of library work has changed very little over time. Regardless of whether they are dealing with papyrus scrolls, medieval manuscripts, printed books, or any other type of analogue or electronic information carriers, libraries have always collected them, stored them appropriately based on the type of material they are composed of and made them available to the relevant user community. Although various types of the library now exist – private libraries, royal libraries, university libraries, national and state libraries, public libraries, special libraries, etc. – they all follow the same basic library principles of selecting, collecting, indexing, preserving, and providing access to information carriers. Aside from traditional library items, such as books and journals, these carriers can also be manuscripts, documents, maps, photographs, and, most recently, audiovisual and electronic media. Libraries make as they have always done these materials available to students, teachers, researchers, members of the public with an interest in science and scholarship, and general-interest readers.

The development of digital technologies for documenting knowledge and creative processes has given rise, not only to digital copies and parallel editions of conventional analogue information carriers but also to new forms of electronic media and associated additional metadata about digital objects. As well as requiring specific forms of storage and means of access, these types of media in their presentation also need comprehensive contextualization because their intangible form would otherwise leave users unable to tap into their content and potential use.

1.4.1 What Is Digital Transformation?

To continue further, we need to define digital transformation, preferably using some simple terms, such as the following one: *“Digital transformation is about doing things differently — creating a completely new business model by using modern information and computer technologies.”* Digital transformation leverages existing knowledge to profoundly change the essence of the organization its culture, management strategy, technological mix, and operational setup. It places the customer at the centre of all its decisions and actions. Several developments enabled the appearance of digital transformation. These enablers include:

- The dramatic increase in IT processing power
- Communication speed
- Introduction of automation and robotics
- The appearance of augmented, virtual, and mixed reality
- Artificial intelligence and machine learning
- Big data
- Strong analytics
- Powerful visualizations

Moreover, here are some drivers behind the push for the use of digital transformation:

- Strong competition
- Financial pressure
- User expectations

‘New normal’ (a product of the COVID-19 pandemic)

We need to keep in mind that the existence and use of modern and powerful IT tools are not enough. Organizations need strong management, solid vision, and forward-looking leadership. New business models also need to be created using available IT solutions, leveraging existing knowledge and profoundly changing the essence of organizations — their culture, management strategy, technological mix, and operational setup. All this is geared towards pursuing new revenue opportunity streams, creating new products, and inventing new services.

There are several research groups and futurist thinkers who are as follows: **Minimalists** believe that libraries are already well-developed and automated, so even with a small change, libraries will meet the needs of the future. In other words, libraries will stay more or less as they are today. Another group of researchers and futurists take a **medium road**, and they advocate for considerable change. According to them, the library will transform through augmentation but would remain recognizable as what we consider today as a contemporary library. A growing group of researchers interested in the future of libraries, foresee a **major change** coming. They believe libraries will undergo a substantial transformation, becoming hardly recognizable, yet still regarded as ‘libraries. In other

words, they will have highly automated collections of electronic texts manipulated by sophisticated AI-based applications, offering text understanding and interpretation, aggregation of ideas, intelligent argumentation, and complex presentation of existing concepts. Finally, a much smaller group of authors takes an *extreme position* and believes that there will be no libraries in the future, or at least, not libraries as we know them today. Instead, there will be intelligent machines of extreme quantum computing power containing all knowledge ever recorded, dealing with knowledge qubits, and capable of coming up with new ideas and offering creative solutions. This does sound like science fiction, but we should not forget that even today many parts of that immense system already exist or are being developed.

1.4.2 Challenges, Opportunities, and Current Trends in Libraries

The development of information technology has also created new opportunities and challenges for libraries. While the introduction of electronic library catalogues greatly simplified and improved methods of indexing and recording media, it also created a need for developing new infrastructures and forms of storing and accessibility for the new electronic media. Electronically produced or subsequently digitized books, journals, maps or photographs can only be used if they are as barrier-free as possible, and able to be retrieved and displayed at any time, in any place. To guarantee this, modern libraries must use new technologies, appropriate and robust infrastructures, new forms of management, a new logic of communication and new routes to financing. At the same time, the digital form of the source of information makes it possible to link and circulate it beyond its local context in an individual library. Central catalogues offered by library networks allow users to find materials from wherever they are.

Digital presentations of electronic media make them regionally, nationally and internationally accessible. Standardized data formats for metadata and digital objects make it possible to create virtual collections according to theme or material, able to be assembled and presented anywhere in the world, irrespective of where the originals are stored. The digital transformation is not only having a profound effect on the way knowledge and creative processes are documented, collected, and shared, but it is also comprehensively changing and expanding the way they are produced. Computers are used to compose, format, and structure texts. Software is used to generate, process, and analyze research data. IT-based research infrastructures enable the development and use of new digital research methods. Having information in electronic form opens the door to methods of processing, linking, and contextualization that would not have been possible with conventional analogue information carriers. Particularly for knowledge production, but also for artistic processes, this has given rise to new forms of collaboration, interaction and exchange between the actors involved. This, in turn, leads to new technologies, new financing needs, and new professional requirements. What do these developments mean for the way libraries work? And what challenges do they present for modern librarians?

Development in the field of information carriers is resulting in libraries collecting, indexing and storing electronic media to the same degree as conventional types of media. This is due to the current technological and cultural situation, in which digital media are emerging in parallel to analogue media, and in which there are different continually evolving demands articulated by traditional readers and the digital humanities, developing new specific methods and digital tools for their different types of investigation. This has a direct impact on library infrastructure. In addition to traditional furniture, such as shelves and special units for securely storing books, maps, and physical audio storage media, libraries now also need suitable and robust IT infrastructures. Of course, libraries have been using IT infrastructures for decades to run their electronic catalogues and library systems for users and order management. However, the high number and increasingly extensive production of electronic publications mean that libraries now also need systems for storing and presenting electronic data, and for archiving them over the long term. These systems must be accessible at all times and perform adequately. They should ideally use standard interfaces that enable free and unlimited data exchange.

Long-term archiving in particular presents challenges that are difficult to solve. Given the rapid development of hardware and software and corresponding changes in file formats, libraries need technical solutions that make it possible to view and use the digital content regardless of the data carrier, original file format, or the software used to produce or needed to access it. The wide range of hardware, software, and file formats available today demands correspondingly complex systems that individual libraries are scarcely in a position to develop or operate. As a result, libraries and other knowledge archives generally must come together in partnerships that are suitably designed, contractually and financially secured, and technologically advanced. In addition to new financing pathways, political support is sometimes also needed, as institutions with different national backgrounds often collaborate. The political will to expand the availability of digital information and digitise analogue information carriers frequently motivates libraries to prioritise collecting digital information and making it available. However, in many cases, the technical and organisational efforts, as well as the financial costs involved in storing electronic media and archiving them over the long term, are not taken into account. Irrespective, libraries must still make these investments and perform the corresponding tasks.

When making digital information accessible, libraries must also address the complex challenge of complying with the law. Copyright, personal rights, and usage rights place limitations on the public accessibility of digital information. Libraries must correctly apply these limitations according to the context of the information, type of material, type of library, use of the information, and the user community.

In recent decades, therefore, the increasingly electronic nature of information production has also triggered a digital transformation in libraries. In addition to conventional forms of collecting, indexing, and preserving analogue information carriers, libraries now also record, store, and present electronic media and information. In parallel to this development, the needs of various library user communities have evolved. Both non-academic readers and those working in academia – particularly in the digital humanities – increasingly request digital information that they can either access using modern devices or analyze and evaluate using IT-supported processes. Some current trends discussed as above in the area of library and information science somehow or rather will have a bearing in shaping librarians and information services in the new economic era. These trends as pointed out in the literature are summarized as follows:

- Access role replaces custodial role.
- Competency-based assessment/training.
- Customer-focused/customer-centred, user-oriented approach in the provision of services.
- Globalization of information.
- Growth of electronic/internet resources.
- Information management is recognized as an important discipline.
- Information is recognized as a commodity.
- Integrated and widespread ICT applications.
- Knowledge management leveraging organization.
- Knowledge-based economy (information/knowledge as drivers to boost the economy).
- Leadership skills.
- Librarians expanded & changes in a digital environment.
- Librarians are designated as cyber librarians
- Librarians need new management knowledge and skills
- Mushrooming of information systems needs for Information Management System (IMS).
- New breeds of information professionals (CIO, CKO, consultants and analysts).
- Role of digital/electronic/virtual library.
- Specialized training in library and information management (Double degree-major and minor concept).
- Strategic alliances partnerships and collaborations
- Trends to develop digital content to facilitate access.

1.5 CONCLUSION

For many centuries, the library has remained almost unchanged, characterized by its physical location, collections of books and documents, types of catalogues, and library professionals helping visitors to find the right information and knowledge. The introduction of computers has challenged almost every aspect of the classic library concept. Having an online library without a physical location, but with access to millions of electronic files, new retrieval tools, and the absence of library professionals to offer assistance are just some of the newly introduced changes. Even a light review of future library scenarios indicates that there are very different future scenarios, predictions, and views. Various new trends are coming-up and some of them have already been used in libraries such as artificial intelligence, virtual reality, Analytics etc. Modern librarians need to develop their own skill sets to remain valuable. In the future libraries will be viewed as a space where users will explore, imagine, debate and generate ideas. It will also be recognized as a space for lifelong learning. Libraries need to facilitate their quest for knowledge.

1.6 SELF-ASSESSMENT QUESTIONS

1. Define the LIS profession and discuss its basic functions and historical background.
2. What is digital transformation? How has digital transformation shaped/changed the work of libraries?
3. Describe various challenges and opportunities available to LIS professionals in the current ICT era.
4. Explain the current global trends of digital transformation in the LIS profession.

1.7 ACTIVITY:

1. Visit your nearby university library and with the assistance of the chief librarian or reference librarian, prepare a plan for the digital transformation of its services to users.

1.8 RECOMMENDED READINGS:

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UNIT-2

TRANSFORMATION OF LIBRARY AND INFORMATION SCIENCE: RESOURCES, SERVICES AND PRODUCTS

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INTRODUCTION

This unit is designed to explain the transformation of library and information science as a discipline. Students can establish a background knowledge of digital transformation in libraries and the application of information technologies in services and products. Moreover, the unit will also describe the emerging technologies in library services and various services and products provided by libraries to their users.

OBJECTIVES

After studying this unit, you will be able to explain:

1. What is the concept of transformation?
2. How are libraries shaping with the advent of ICT?
3. What are the emerging technological changes and application of innovative technologies?
4. How are librarians providing various library services using emerging technologies in libraries?

2.1 INTRODUCTION

Libraries are mainly entrusted with a host of predetermined tasks like acquiring, organizing, preserving, retrieving and disseminating information to the user. From ancient times to the present Internet age, the primary objective of the library has always been this. However, towards the beginning of the 21st-century world over, there has been a phenomenal paradigm shift in the rendering of library and information services. The implication of the influence of Information and Communication Technology (ICT) in every sphere of human development is visible and its impact on library and information services cannot be overemphasized. In today's world, library and information services delivery is being transformed from its manual operations to new ways with the use of technology. The new technology and communication tools are employed in rendering services to the patrons through appropriate channels for access to information with a cluster of technologies referred to as the internet. The technology called the internet can complement, reinforce, and enhance educational accomplishments for the benefit of all.

The resultant effect of this development has been the emergence of electronic services in libraries which has become the basis for digital libraries. Library services are assuming a different dimension in philosophy, model and information delivery. The trend worldwide has proved that information provision and delivery had shifted from the traditional models to electronic and web-based formats. Traditional collections are giving way to if not total but at least hybrid collections. This change in structure is not without its attendant challenges as electronic and digital libraries come along with their peculiar characteristics despite sharing the same purpose of preserving, organizing and distributing information resources as in the case of traditional libraries.

According to IFLA World Summit on the Information Society 2003. It is worthy of mention that library and information services are key actors in providing unhindered access to essential resources for economic and cultural advancement. In doing so, they contribute effectively to the development and maintenance of intellectual freedom, safeguarding democratic values and universal civil rights. They encourage social inclusion, by striving to serve all those in their user communities regardless of age, gender, economic or employment status, literacy or technical skills, cultural or ethnic origin, religious or political beliefs, sexual orientation or physical and mental ability. The communities they serve may be geographically based or, increasingly, linked only by technology and shared internet. The import of this new attitude of information creation, access, retrieval, storage and availability for use in a major transformation towards creating an information and knowledge-based society for the good of all.

2.2 ERA OF TRANSFORMATION IN LIBRARIES

The shift from traditional libraries with site-specific collections to digital libraries where information and knowledge sources have no geographical boundaries seems to expand the services of library and information delivery to users. Before the era of ICT, libraries provided important services in processing organising storing and preserving information for individual users and organisations. Based on the various ways of information packing, the libraries became a veritable access point to information delivery to end users.

The emergence of ICT, brought about changes to the organisation, access and management of information. With the new technology, it became possible to access a variety of information in a manner that would be simple and easy, and independent of time, place and subject Area. In present times, libraries are institutions with large collections of books and other materials and are usually funded and maintained by parent institutions. Usually, these materials are readily available to those who need knowledge but cannot afford them to keep in their possession. From the evolutionary process, society has transitioned from time information was scarce and precious to when there is much information available to respond to individual and organisational needs. In the past, the services provided by the libraries grew to include cataloguing, classification, indexing, current Awareness service CAS, selective Dissemination of information (SDI), reference, referral, and photocopy services among others.

The traditional services libraries and allied professionals are known for are upgraded and the consequence of using innovative technologies shaped the services of libraries as follows:

- OPAC and Web OPAC searching facilities
- Virtual Reference Desk (VRD) or Virtual Reference Services (VRS) using E-resources on the net and CD-ROM, gateways, portals and online databases.
- FAQ, Ask Librarian etc provide advanced services.
- Database searching for complications of bibliographies and searching topical information provided unique search features and a variety of display formats.
- CAS is based on electronic publications and internet resources.

2.3 APPLICATION OF INNOVATION TECHNOLOGIES

Taking a historical perspective of the library showed it as a store base, an archive of manuscripts, art and important documents. Books in medieval times were not affordable

for most people; as a result, collections were put together under security checks. The situation was like that for a long time.

A huge turning in the evolution of libraries has been identified in the literature and indicated three-phase processes in organizations due to the application of ICT.

1. Modernization: doing what is already in process but with more efficiency
2. Innovation: new capabilities are possible due to trends like ICT
3. Transformation: fundamentally altering the nature of the organization.

In the modernization of libraries, ICT was used to manage the collection and automate the libraries since the 1980s. Later innovative concepts and transformations in library activities took place due to scholarly communication, database development, internet and web tools usage in libraries as well as print media shifted to digital and networked information appeared in libraries. The acceptance of new technologies, new information storage media, publishing trends, communication tools, internet, web tools, access to information and search is leading to complexities like information mining due to the development of databases and information warehouses, demand for global information is growing exponentially, transitioning from a product-based economy to an experience-based economy, libraries are transitioning from a centre of information to a centre of culture and assist users in different ways. The implication is that the development in libraries might be slow, however, libraries have initiated practices of subscribing to digital resources, e-books, e-journals and databases. The use of the internet is more in libraries as it is proven as a tool for information collection. Digitization and repositories are initiated in many libraries. However, there is a need to initiate library and information services using modern information resources and technologies.

2.4 IMPLICATION OF TECHNOLOGICAL CHANGES IN A LIBRARY ENVIRONMENT

Information has always been a prime factor in the development of society and is often regarded as a vital national resource. The growth of information and the dependency on it have paved the way for the information society and subsequently the knowledge society. Information has become an important part of our lives and should be available when needed. For daily operations in a library environment, information is a valued resource for meaningful communication. Information services are generated using new tools and techniques to facilitate the right users to the right information at the right time at the right cost. Information technology has had a significant impact and has successfully changed the characteristics of information services being generated in libraries. The use of technology in library operations meant that users could interact with online

systems and have less reliance and dependency on library personnel. The current situation in most libraries today allows users to check circulation information without even contacting the staff in the circulation unit.

The implication is that the user-friendly technology is interactive which most times does not require the assistance of library staff. As expressed by IFLA World Summit on the Information Society 2003 libraries have grasped the opportunities presented by the application of new technologies to revolutionise the technical processes required to deliver services. Examples include shared cataloguing, whereby many libraries share the task of preparing catalogue records so that duplication of effort is avoided. Other examples include self-issue and return systems, and security measures. The most dramatic impacts have been in the expansion of the range of materials collected and made available, together with the ability to reach users regardless of geography. The 'Library without Walls', once a dream is now emerging as a reality. The role of the library as a place for people to gain ICT skills in a welcoming atmosphere is becoming a decisive element in capacity building. Technology is gradually transforming the lives of library users who have been largely excluded from using traditional library materials, for example, the visually impaired. This development is a pointer to the fact that innovative technologies introduced to information delivery being positioned to impact position on the lives of all people irrespective of whatever difference they might have.

The library should accept this opportunity to better the lives of human society. Innovation technologies have become a catalyst in the dissemination of information for all spheres of human existence. This era of variety of innovation has made the world a global village where distance, location and mode of information package is no longer barrier to accessing information have progressed from conventional books and journals to electronic journals and online databases, making it possible to explore to the worldwide pool of knowledge while sitting at one's desk or home. One of the impacts of the application of innovative technologies has been observed by studying the online literature available in databases is reduced dependence on a library for publication access as users who are computer literate can access Online publications from anywhere; information can be searched, transmitted and reproduced using network technology; and professionals have the opportunities to reach a wider audience of users and colleagues, and boundless access to global information and so on.

2.5 EMERGING TECHNOLOGIES IN LIBRARY SERVICES

Emerging technologies provide librarians with a unique opportunity to substantially enhance user-centered services and facilitate and promote collaboration between libraries and their users. Emerging technologies provide opportunities for library professionals in identifying, collecting, organizing, customizing and deliver information products and

services in a range of formats and varieties to the user community both on-demand and in anticipation in physical and virtual environments in real-time. Though the library is independent of technology given the fact that every library activity designed or built with active participation and feedback from its user community qualifies the concept of a library, emerging technologies can help libraries to create a collaborative and participative environment that is necessary to deliver user-centric library services and to create new resources and build-upon existing ones using the collective intelligence of users. The availability of technologies gives libraries the ability to offer improved customer-driven services to their users. As the web has been emerging predominant mode of communication, transaction and consumption, that has emphasized all spheres of human life. The web environment enabled human resource potential as the foremost significant factor in developing the world. Most Higher education institutes being the major stakeholders in human resource development are adopting newer technologies to reach the unreached and bridge the gap. Libraries are the heart of society and always take a leading role in circulating the knowledge blood among the community with a range of sources and services. E-resources have posed a great number of challenges and opportunities to library professionals in enhancing the information environment. The advent of ICT is indeed a boost to the library services as it now assists many librarians to use their ICT potential to reach out to library users some of the ICT-based services that are provided by libraries are as follows:

2.5.1 Instant Messaging (IM): Instant messaging or IM is a form of real-time, virtually instantaneous communication between two or more people using the textual format. Libraries are already deploying IM for providing “real-time reference” services, where patrons can synchronously communicate with librarians much as they would in a face-to-face reference context. Software used in libraries for “live reference services” are usually much more robust than simplistic IM applications. This software often allows co-browsing, file-sharing, screen capturing, data sharing and mining of previous transcripts. Libraries can benefit greatly by adopting this technology as it evolves since it facilitates reference services in an online mode quite similar to traditional reference services of the physical library.

2.5.2 RSS Feeds: RSS stands for Real Simple Syndication or Rich Site Summary. The technology, on one hand, allows a website (or e-publisher) to list the newest published updates (like a table of contents of journals, or news articles) through a technology called XML; on the other hand, it facilitates a web user to keep track of new updates on the chosen website (s). Like a personal search assistant, RSS feed readers visit pre-defined websites, look for updated information and fetch it automatically onto the user’s desktop. It provides users with a way to syndicate and republishes the content on the Web. Users republish content from other sites or blogs on their sites or blogs, aggregate content on other sites in a single place, and ostensibly distil the Web for their personal use. Libraries are already creating RSS feeds for users to subscribe to,

including updates on new items in a collection, new services, and new content in subscription databases. They are also republishing content on their sites.

2.5.3 HTML Feeds: HTML feeds are RSS feeds converted into HTML codes to facilitate peer-to-peer interaction amongst researchers and sharing of RSS search results. The HTML codes can be placed onto the websites and the resulting HTML feed can be customised to compliment the page. HTML feeds allow quicker access to information to visiting users. Elsevier Science has implemented HTML feeds for Scopus, the citation database from Elsevier.

2.5.4 Streaming Media: Streaming multimedia is the sequential delivery of multimedia content over a computer network that is displayed (or played back) to the end-user as it is being delivered by the provider. The streaming of video and audio media is an important application that existed before the Web and finds its application on the Web too. With the availability of computer and network infrastructure to support multimedia streaming, library instruction delivered online began incorporating more interactive, media-rich facets. The static, text-based tutorials are being transformed into multimedia-based interactive tutorials. Several tutorials use Flash programming, screen-cast software, or streaming audio or video, and couple the media presentation with interactive quizzing; users respond to questions and the system responds in kind. Tutorials were the first library applications to migrate into the more socially rich Web. Besides its applications in computer-generated instructions, streaming media would also be available increasingly in its collections. As media is created, libraries will be responsible for archiving and providing access to them. Libraries are already beginning to explore providing such through digital repository applications and digital asset management technologies.

2.5.5 Podcasting: The word “pod casting” is derived from two words, namely “broadcasting” and “iPod” (a popular MP3 player from Apple Computer). Pod casting is defined as the “process of capturing audio digital-media files that can be distributed over the Internet using RSS feeds for playing-back on portable media players as well as computers. Users can subscribe to such feeds and automatically download these files directly into an audio management program on their PCs. A podcast is distinguished from other digital media formats by its ability to be syndicated, subscribed to, and downloaded automatically when new content is added, using an aggregator or feed reader capable of reading feed formats such as RSS or Atom. Several libraries use podcasts to support library orientation programmes. Taking advantage of podcasting and other consumer technologies as a delivery media for the library’s content and services is a great leap forward for the library profession.

2.5.6 Vodcasting: The “VOD” in Vodcasting stands for “video-on-demand”. It is identical to podcasting. While podcasting is used for delivering audio files, vodcasting is used for delivering video content. Like podcast content, vodcast content can be played either on a laptop or a personal media assistant device (PMA).

2.5.7 SMS Enquiry Service: Short Message Service (SMS) is a mechanism of delivery of short messages over the mobile networks. The SMS enquiry services in a library allow patrons to use their mobile phones to SMS their inquiries to the library. The reference staff deployed to attend to such queries can respond immediately with answers or with links to more in-depth answers.

2.5.8 Blogs: A blog is a website, usually maintained by an individual, with regular entries of commentary, descriptions of events, or other material such as graphics or video. Entries are commonly displayed in reverse chronological order, and they are usually considered lightweight publishing tools. Blogs provide control to an individual or group of individuals for publishing content or making commentary on it. Technologically, blogs are easier to use, platform-independent, and accessible online over the Internet. Broadly, blogs can be said to be online dairies, however, thousands of blogs are maintained by experts in different subject areas who are willing to share their knowledge, understanding and opinions with other people. Michael Casey, who coined the term Library for example maintains a blog called Library Crunch on Library. The most obvious application of blogs for libraries is use them as a tool for promotion, publicity and for outreach services. Libraries can disseminate information to their users; make announcements about their new resources and events through their blogs. Blogs can be used to initiate debates and interactions amongst users and staff. Moreover, library staff and users can be encouraged to use Library blogs to get to know each other and interact on a personal level.

2.5.9 Wikis: A wiki is a collection of web pages designed to enable anyone who accesses it to contribute or modify content, using a simplified markup language. Wikis are often used to create collaborative websites and to power community websites. For example, the collaborative encyclopedia, Wikipedia is one of the best-known wikis, that has broken down one of the golden rules of librarianship, i.e., content validation and authenticity of the information. Wikis are also used in businesses to provide affordable and effective Intranets and for knowledge management. Wikis can essentially be equated to open web pages, where anyone registered with it can publish on to it, add to it, amend it and change it. As in the case of blogs, Wikis do not have reliability as traditional resources. Despite this, their value as an information resource cannot be undermined. Libraries can use the wiki as a communication tool to enable social interaction among librarians and patrons. Users can share information, ask and answer questions, and librarians can do the same within a wiki. Moreover, a record of these transactions can be archived for perpetuity. Transcripts of such question-answer sessions would serve as a resource for the library to provide as a reference. Furthermore, wikis will ultimately evolve into a multimedia environment, where both synchronous and asynchronous audio and video collaborations will take place.

2.5.10 Social Networks: A social network service is a web-based software that facilitates the creation of virtual social networks for communities of people who share interests and activities or who are interested in exploring the interests and activities of others. Most social network services are web-based interfaces that facilitate a community of users to interact with each other by deploying tools such as chat, messaging, email, video, voice chat, file sharing, blogging, discussion groups, etc. Facebook, WhatsApp, YouTube, e.t.c. while FaceBook and WhatSappenable users to share themselves (detailed profiles of users' lives and personalities), YouTube enables users to share Videos on the web resources. Social networking services could enable librarians and patrons not only to interact but to share and exchange resources dynamically in an electronic environment. Users can create accounts with the library network service; see what other users have in common with their information needs and recommend resources to one another. Besides, libraries can also recommend resources to users through their network, based on similar profiles, demographics, previously accessed resources, and a host of data that users provide.

2.5.11 Tagging: A tag is a keyword or term, or subject heading assigned to a piece of information (a picture, a geographic map, a blog entry, a video clip etc.,), thus describing the item and enabling keyword-based classification and search of information. Tags are usually chosen informally and personally by the author/creator or by its consumer/viewers/community. Tags are typically used for resources such as computer files, web pages, digital images, and Internet bookmarks. While cataloguing is a fundamental skill of librarians, the art of tagging is essentially a prerogative of the user which enables them to assign keywords to a piece of information or object. The user can define and categorize information based on his or her perception of a given piece of information. In Library, users could tag the library's collection and thereby participate in the cataloguing process. The best thing about tagging is that everyone is allowed to categorize the information the way they want. The catalogues of the library would enable users to follow both standardized and user-tagged subjects, whichever is more convenient or makes better sense to a user. In turn, they can add tags to resources. The user responds to the system, the system to the user. This tagged catalogue would be an open catalogue, a customized, user-centred catalogue.

2.5.12 Social Bookmarking Services: Social bookmarking is a method of storing, organizing, searching and managing bookmarks of websites using descriptive metadata. In a social bookmarking system, users can save links to web pages that they want to remember and /or share with other users. These bookmarks can be made public or saved privately or shared only with specified people or groups of people. The authorized people can usually view these bookmarks chronologically, by category or tags, or via a search engine. Most social bookmark services encourage users to organize their bookmarks with informal tags instead of a traditional browser-based system of folders, although some services feature categories/folders or a combination of folders and tags. These services also enable viewing of bookmarks associated with a chosen tag and include information about the number of users who have bookmarked them. Some social bookmarking services also draw inferences from the relationship of tags to create

clusters of tags or bookmarks. Libraries can make use of social bookmarking sites using RSS feeds for subject disciplines or in areas of specialization relevant to them.

2.6 CONCLUSION

The ever-changing landscape of the information paradigm poses a host of new ways of service delivery using emerging web technology which will automatically bring new areas of skill acquisition for librarians to bridge the gap. The trending issues and emerging technologies pose challenges not only to the library and information professionals but to the users, patrons and scholars and the publishing community as well. Indeed, the new environment throws up a host of unprecedented features and avenues, and interestingly enough, if we know how to tap them well, we find there is a plethora of opportunities, most of them even for free. Emerging technologies provide librarians with a unique opportunity to substantially enhance user-centred services and facilitate and promote collaboration between libraries and their users in this digital era. Adapting to some of these trends and implementing some of the emerging web technologies are likely to improve the reputation and standing of libraries in the community. Some of them may successfully attract new patrons to the library, others may help to retain existing members or make libraries even more important as centres of the culture and history of their cities and academic institutions. These new services and ongoing changes are likely to make libraries more interesting, more relevant, and better acceptable places. However, methodologies, applications and concepts will continue to change within libraries.

2.7 SELF-ASSESSMENT QUESTIONS

1. Define transformation in libraries and discuss the role of libraries in this changing scenario.
2. What are various emerging technologies, and how are these technologies shaping the library's future?
3. Describe various services and products provided by libraries in the current digital era.

ACTIVITY:

1. Prepare a comparative chart of library services regarding the print era and digital era.

RECOMMENDED READING:

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Unit-3

LIBRARY AND INFORMATION SCIENCE PROFESSION: OPPORTUNITIES AND CHALLENGES

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INTRODUCTION

This unit is about the challenges faced and opportunities available to the LIS profession in the current digital era. The discussion on LIS education, the impact of ICT and other emerging technologies on the profession is a main part of the unit. The case studies of the USA and South Africa are discussed in detail to give an outline of the challenges faced by the libraries, librarians and users of LIS.

OBJECTIVES

After studying this unit, you will be able to explain the following:

1. What are the challenges and opportunities of the LIS profession?
2. How is the USA and South Africa coping with the change in respect to ICT?
3. How public libraries in the USA is facing the challenges of digital transformation?
4. How is the LIS profession transforming its services and functions in the ICT era?

3.1 INTRODUCTION

In every area of information technology computing, communications, and content management there has been tremendous development over the last decade. In the area of computing, we have watched: the advent of personal computers, worldwide packet networks, optical disc and other mass storage media technologies, interactive video technology, image technology, computer graphic technology, scanning technology, voice technology, animation technology, and multimedia/hypermedia technologies. In the area of content management, we have witnessed the growth both in size and in several massive public and private databases bibliographic first, then numeric, and now multimedia. In the area of communications, there has been enormous development in electronic digital communications via which multimedia information can be transmitted worldwide at an incredible speed. Computing, communications, and content were rather disparate in earlier years, but are becoming increasingly integrated and quite international in scope and impact. In addition, we have also seen the convergence of all these new information technologies with conventional media.

Information seekers are no longer satisfied with only print-based information. Advances in multimedia technologies make it possible now for us to provide instant information access to any type of information one desires text, data, still images, motion pictures, and sound. Thus, as we enter into this "Visual Information Age," the challenges to library and information professionals are indeed great. So are the opportunities. In an interview with Carol Tenopir, Chancellor's Professor, School of Information Sciences, the University of Tennessee we found answers too many questions regarding trends, challenges and opportunities for the LIS profession. In her words, it is hard to imagine now, but in those early days, the ultimate users of the information didn't conduct their searches. Online databases were only for specialists who searched for information on behalf of their clients. Putting hardware, software and information sources in the hands of everyone had a remarkable and profound change. People expect instant, low-cost or free online access to whatever they need or want, whenever they want it. Service providers and systems have to work to meet those continually escalating expectations. Roles within the library including educators, licensing negotiators, digital library builders, research partners, and systems integrators have become more important.

Libraries do not have a monopoly on providing access to information anymore, so they need to emphasize their value as providers of unique (digitized) content and as service providers, rather than as providers of published information that can be found elsewhere. That means an emphasis on locating, digitizing (perhaps), and preserving the unique content of their institution or region; information and data literacy education; integration of information content from a variety of sources; and personalized information and data services to their researchers and institutions that provide unique value to individuals and institutions. Many libraries now provide a link between the scholarship created by their researchers and the need of their institutions to demonstrate the value and impact of that scholarship, so assessment is an increasingly important role of libraries.

The low status of the library profession and doubts among its practitioners about their professional identity are hampering the social role of libraries. The consequences of this have been the exodus from the profession and its failure to attract new entrants.

3.2 LIS EDUCATION AND CURRENT CHALLENGES

Libraries have changed, and education has changed to try to respond to those changes, if not driving them. Programs offer more specializations now, including areas such as research data management, user experience testing, assessment, digital library development, embedded librarianship, digital scholarship/digital humanities, web design and digital archives, along with more traditional specialities such as children's and youth services, information organization, and information retrieval. LIS professionals today need the conceptual generic basics, but they also need specialized knowledge and skills. Globally, LIS education is reaching out to a wide variety of faculty specializations. Research in LIS has also changed to recognize a wide variety of methods (qualitative as well as quantitative) with more focus on the human factor in information rather than just the mechanical or system side.

LIS education needs to address how open science issues, including open access and open data, affect scholarship, scholars and, ultimately, science and society. For example, there is the human side that involves helping researchers learn about and participate in the process while recognizing their concerns. Librarians also need the technical skills to provide metadata services, manage institutional repositories and assist with research data management to further the open science practices at their institutions. Researchers are faced with funding and governmental regulations requiring the deposition of data and articles in repositories. Information science professionals can help this happen by providing either repositories or links to repositories and helping researchers with the processes needed to deposit. Preservation is an important part of this as well. And the need for education about high-quality sources never goes away.

3.2.1 Impact Of ICT On Lis Education

The impact of information and communication technology has a direct impact not only on the library and Information profession but on LIS education as well. So far, the emerging technologies and their applications have not been paid proper attention in imparting practical training to LIS education. The LIS schools are finding it difficult to design inter-disciplinary curricula for education and training. Unless professional education adopts the topics of changing technologies and their related techniques like databases, online retrieval, records management archives and marketing of information, it would become obsolete. The professional experts visualize a threat from the computer professionals, systems, analysts, communication specialists, scientists and technocrats who are slowly encroaching upon our profession. The LIS curriculum is expected to provide trained personnel capable of handling information, managing information and disseminating functions from libraries and information centers more effectively even in a technological environment. To cope with the changing environment there is a need for revising the existing curricula in LIS schools.

3.2.2 What Challenges Do LIS Educators, Students and Researchers Face Today?

Internationalization, reforms and maintenance of standards in higher education is the topmost priority of every national government aiming to improve the quality of higher education at par with global standards. Infrastructure development alone (Physical, human, financial including ICT infrastructure) does not create the best manpower for a country, equally important is an up to date, need-based curriculum and syllabus combining both the latest knowledge and skills, innovations, and best practices which will provide an opportunity to a post-graduate student to stand alone in the national and global job market. This has necessitated a radical change in the LIS curriculum and syllabus keeping in view the need for the information workforce required in the international/global market. This will eliminate the wide disparities in LIS education, practice and research between the developing and developed countries. The goals of these efforts are to facilitate the mobility of students and to increase employability. An emphasis on quality assurance in LIS education internationally allows improving the skills of individual students and increasing the standards of LIS education in the country. This will further help in nation-building through the application of knowledge and skills to cope with the expectation of 21st-century teaching, learning and capacity building.

A good LIS school is essential to the transformation of the education system, which aims to provide quality education for all learners. International research has provided convincing evidence of the vital contribution of LIS schools to quality education and student achievement. It is important to stress that resources do not refer to money; they may refer to teacher competence, an inadequate or absence of a LIS education. The mere provision of a LIS education will not create quality schooling. Any planning for establishing a LIS school must take into account the consensus in the international research literature that effective school LIS education depends on the following interdependent factors:

1. Adequate infrastructure: a proportion of the school budget allocated to the collection and a teacher-librarian in charge.
2. A team approach: The relationships among principals, educators and LIS staff are crucial.
3. Consensus on the kind of learning that is valued.
4. Integration of information literacy education in the learning programme.

In the words of Carol Tenopir, Chancellor's Professor, School of Information Sciences, University of Tennessee there are two major challenges:

1. Anticipating future trends to provide education that will be relevant; and
2. Deciding what specialities make sense for them to focus their energies on.

Other challenges derive from those. These include keeping curriculum forward thinking and relevant, while not abandoning the traditional aspects; marketing their programs to reach a diverse group of students; working with potential employers to make sure their students are ready for jobs and will be hired, etc. A combination of classroom education and experiential learning is important.

3.3 THE LIS CHALLENGES: A CASE STUDY OF SOUTH AFRICA

In April 2008, the National Council for Library and Information Services (NCLIS), in consultation with the Department of Arts and Culture (DAC), brought together seven people to form the Library and Information Services Transformation Charter Technical Team. They were invited, not as representatives of organizations and institutions, but in their individual and personal capacities. Most of them are from the Library and Information Services (LIS) sector and have varied experience as academics, practitioners, policy development experts and public officials. Their assignment was: to define the challenges facing the sector and to provide a clear framework of principles and mechanisms for effecting the changes needed for the sector to contribute to the elimination of illiteracy and inequality and build an informed and reading nation. The starting point was the recognition that, in the information age, access to information is crucial and is a source of wealth and power. Access to information makes better people, more efficient and effective workers, and more responsive and responsible citizens. So, rather than considering the library as the site for the training of the young elite, we should rethink the library as an institution, as a special place for everybody, as accompanying all South Africans throughout their lives. It should be systematically integrated into the economy and society as the preserver and transmitter of knowledge and information.

For the majority of people in developing countries, the lack of information is the main impediment to their development. This state of affairs is due not only to scarce material resources but also to a lack of appreciation of the developmental role which the library and information sector plays. In our opinion, there is no more important developmental policy than one oriented towards eradicating information illiteracy and building a modern, efficient, and equitable library and information system. Both governments, together with their social partners, the private sector, civil society organizations, households and international aid agencies, should support this. It is in the national and global interest to make South Africa a more information-literate nation. What is clear is that if Government does not create the right conditions for the development of the sector, no amount of support from its social partners will succeed in this endeavor.

Most of the challenges facing South African LIS originate in the comment that South African society undervalues and underfunds LIS. The educational, cultural and social contributions of LIS – both actual and potential - are generally underestimated. The Charter's investigation uncovered the following urgent challenges:

- The uneven and unequal provision of resources within all LIS subsectors continues to reflect apartheid. Access is difficult and participation is minimal.
- The low profile of the sector is understandable given the shortages of LIS. Millions of rural South Africans live out of reach of LIS and 87% of schools do not have functional LIS.
- The uncertainty over overlapping and confusing government responsibilities and mandates has hampered the growth of LIS.

- All LIS sub-sectors suffer from the absence both of norms and standards and of empowering legislation. Perhaps the most urgent need lies within the school LIS sector.
- Insufficient information resources in indigenous languages.
- The low status of the LIS profession is evidenced by prevailing poor remuneration, low numbers of new entrants, the exodus of experienced staff and dwindling student numbers in university LIS schools. LIS schools are threatened with closure. Inappropriate appointments of unqualified staff in school and public LIS exacerbate low morale among professional staff and add to the prevailing doubts over professional status.

The description of current challenges suggests that LIS are probably viewed by most as irrelevant collections of books for the educated and middle class. The question confronting the LIS sector is: How can South Africans value something they have no access to and no use for?

The Charter presents a vision of a transformed LIS which will have the following indicators:

- LIS are within reach of all South Africans. Access is free.
- More than 50% of South Africans are regular visitors and members. LIS are seen as places for everyone, catering for the marginalised such as people with disability, rural citizens, the jobless and the incarcerated.
- The various sub-sectors collaborate to ensure a borderless LIS system which is free of barriers and achieves equity of provision for all citizens.
- LIS are guided by norms and standards. The norms and standards provide for the needs of people with disability.
- There is an integrated funding model which ensures sustainable growth of the sector.
- LIS staff are committed professionals and are respected as such by their parent institutions, government bodies and user communities. They are appropriately qualified and remunerated. They are engaged in continuous professional education and development. They have codes of ethics and are held accountable.

The Charter's vision for LIS is attainable. Despite the challenges, its investigation found evidence of many innovative programmes and high levels of energy and commitment among LIS practitioners in all sub-sectors.

3.4 CHALLENGES FACING PUBLIC LIBRARIES: AS A CASE STUDY OF THE USA

Public libraries today are at a critical juncture. Approaching the turn of the millennium, we heard much handwringing about whether public libraries would become obsolete, and we faced constant questions about how libraries can remain relevant in the age of online information. Nearly 20 years later, libraries have successfully transformed themselves from being chiefly about materials to being community anchors for formal and informal learning, technology access,

workforce development, and community engagement. But while public libraries have reinvented themselves into a key element of social infrastructure.

As stated by Mark Smith, Texas State Library and Archives Commission, Austin, the USA from his perspective as a state librarian – and representing purely in a considered opinion following are the areas that seem of most concern to the long-term health and vitality of the public library.

3.4.1 Growing Mistrust of Government

As a unit of government, typically at the municipal or county level, it should be of concern to public libraries that the percentage of Americans who mistrust government is rising sharply. This dim view of government is particularly characteristic of attitudes toward the federal level, which is damaging to library operations at the federal and state levels and indirectly affects local public libraries through a loss of funding, policy voice, and stature. Is the perception of local government more positive? Possibly, but an underlying concern of several of the trends identified in this article is an overall lack of trust in public institutions.

3.4.2 Erosion of Faith in Objective Information

Future where objective truth is society's most important value, and the official record is faithfully guarded by – you guessed it – librarians. These are the custodians of the Record. In other words, a past that looks distressingly like our present. Those of us of a certain age can remember when people agreed about basic facts when science was considered gospel, and we looked up to experts in academia, government, and industry. While research shows that public trust in scientists has remained relatively stable since the 1970s the question of confidence in the media is particularly troubling as significant portions of the public mistrust the news they get and increasingly turn to non-objective sources of information.

This trend is troubling because it undermines what we thought would always be regarded as authoritative sources of information and undermines the ability of people to make decisions about their lives, families, and communities. And while the public seems to continue to have a high level of trust in the authenticity of the information from libraries, I worry that just as we have seen confidence in the reliability of information from other sources erode, the public could lose faith in the authenticity of the information from the library, undermining one of the most important pillars of the library's value to society.

3.4.3 The Decline in Civility and Civic Engagement

An inevitable consequence of the loss of faith in government, public institutions, and objective information is the loss of civic engagement, measured by such indicators as volunteerism and lack of participation in civic life, including voting. Libraries can and should be an antidote to polarization and social disintegration. Building places where all kinds of people can gather is the best way to repair the fractured societies, we live in today libraries are among the most critical forms of social infrastructure that we have. But what happens when the overall loss of faith in government and public institutions takes greater root at the local levels of government? I fear that the effect will be a loss of engagement with civic institutions like the library, including an increasing fear of interacting with each other in a public space, and a loss of interest in or time for volunteering at the library.

In the city where I live, I hear parents say they are afraid to take their children to the beautiful new Austin Public Library because they are troubled by all the homeless people. This seems to me an example of the compounding of one problem with several others. As the eroding middle class leads inevitably to more homelessness, and a lack of other forms of social infrastructure sends the homeless into libraries, people respond by withdrawing from engagement in public spaces, leading to a worsening of all of the above. My usual response to such parents is to point out the opportunity to use the situation as a teachable moment, but that sometimes seems like a tough argument to sell.

3.4.4 The Disappearing Middle Class

Another worrisome trend is growing income disparity and the disappearance of the middle class. You might not readily see why this is a matter of concern to library work specifically. But recall for a moment the foundational history of the public library, which has always been an institution rooted squarely in the aspirations of the middle class. Andrew Carnegie, who coined the phrase, “palaces for the people,” believed that the potential power of the public library was not for the rich, but for the striving middle classes who sought to pull themselves from humble means to achieve their potential through self-education, cultural enrichment, and civic engagement. Libraries can and do serve those in poverty, but as their needs grow and as safety nets are diminished, the burden that falls on libraries may overwhelm the library’s capacity to respond. This situation seems likely to become more challenging as safety nets for mental health, and other social services are impacted and perhaps lose crucial funding.

3.4.5 Tax Revolt and The Tyranny Of ROI

As the government has faced an increasingly urgent tax revolt that dates at least to 1985 with the founding of the Americans for Tax Reform, coupled with an overall distrust of government (see trend number one above), libraries, like all aspects of the public sector, have had to find creative ways justify their existence. This is not a bad thing in itself. Accountability is important, and libraries and other public sector services should be accountable to taxpayers. For too long library advocates relied on arguments of intrinsic social good to win the day. Libraries stand up well to scrutiny. For the mere meagre amounts that libraries generally receive, they can demonstrate a significant return on investment.

The only problem with this is that such analyses leave out some of the most important work that public libraries do for society. How can an economic development study return a dollar value on the role it plays in teaching children to read, keeping kids focused on learning during the summer months, providing a safe space for teenagers to come together in positive after-school interaction, or in providing a lifeline of reading and information for a senior adult? ROI studies can and do identify how libraries create sustainable communities by teaching STEM skills in maker spaces, or helping people find jobs and start businesses. Most library advocates would agree that such services are core to our mission, but we have not done an effective enough job yet of articulating value beyond ROI.

3.4.6 The Decline of Attention Span

In her intriguing book, *Bored and Brilliant* (2017), technology writer and podcast host Manoush Zomorodi (2017) write at length about the effect that smartphones and other devices have on our ability to concentrate. Zomorodi makes a compelling case that not only cause us to lose our ability to focus on longer pieces of information, but they also interrupt the very valuable experience of being bored.

Some of us might think this behaviour has a humorous side, especially when we notice so many people around us staring at smartphones all day, sometimes even walking into us on the sidewalk while engrossed. But public librarians should find the implications real and troubling. Public libraries have traditionally been about the deeper dive, the thoughtful reflection. The often-noted serendipity of wandering through the stacks may be a pleasure that we have lost in our need to be constantly and instantly gratified. People may recognize the value of libraries, but how much will they use libraries once they lose the capacity for close reading and slow thinking? This seems to me to lead inevitably to...

3.4.7 The Decline in Reading

In 2004, a startling report from the National Endowment for the Arts titled *Reading at Risk* documented the sharp decline in literary reading between 1982 and 2002. Then-NEA chairman poet Dana Gioia set out to tour the country talking about his concerns about this trend. In the introduction to the report, Gioia writes, “More than reading is at stake. As this report unambiguously demonstrates, readers play a more active and involved role in their communities. The decline in reading, therefore, parallels a larger retreat from participation in civic and cultural life”

Has the situation improved in the last 15 years? No, on the contrary, we continue to lose readers. While book checkouts are only one of several functions of the public library, books, book-reading, book-related programming, and literacy services continue to be a core function of the public library. Even if these were not such important core services, Dana Gioia’s comments about the relationship of reading to social cohesion and civic engagement point us to some of the reasons why the concern about the decline in reading should be a major concern to the public libraries.

3.4.8 Lack of Diversity

According to figures from the American Library Association, 86.7 per cent of ALA members self-identify as white, 4.4 per cent as African American, and as a subtotal of the whole, 4.7 per cent as “Hispanic or Latino” (ALA 2017). In 2006, ALA also released a report on diversity in the profession entitled “Diversity Counts” which was updated in 2007 and again in 2012, analyzing data from the Institute of Museum and Library Services and the National Center for Education Statistics. The data indicate that of all credentialed librarians, 85.2 per cent are white, 5 per cent are African American, and 4.8 per cent are Latino (ALA 2012).

These numbers are of concern, and they do not appear to be improving. For these reasons, ALA has set increased diversity in the profession as a strategic priority of the association. That is entirely appropriate because if the profession cannot attract a diverse workforce, especially at the professional and managerial levels, public libraries will become increasingly out of touch with

the needs of their communities and non-responsive to societal and cultural realities. In Texas, as in other states, the percentages of non-white segments of the population are growing at a much faster rate than whites. For the public library to remain a vital and valued institution, we need library staffs that more closely mirror the demographic make-up of their communities. I am concerned that even if there is a will for diversity hiring, the pool of applicants may not be available, especially MLS candidates. Creative and proactive strategies are going to have to be pursued if we are truly committed to building a more diverse staff.

3.4.9 Lack of Recognition

While I cannot point to statistics to bear this out, I have worked in libraries for over 35 years, and I have consistently seen evidence of a lack of respect for librarians in many settings. The lack of regard for the library and what it offers to a community can be seen in the ongoing low levels of funding for public library service. It is evident in the President's zero-funding of the IMLS every budget cycle. It is evident in the ways that public librarians are often left out of management teams of cities, or off crucial city and county commissions such as those exploring broadband, economic development or workforce. It is evident in the surprised looks I inevitably received when, in the aftermath of Hurricane Harvey in 2017, I would tell leaders from other sectors that the Federal Emergency Management Agency officially recognizes libraries as essential services. Nevertheless, I watched with awe as the Houston Public Library under the direction of Dr Rhea Lawson, and with support from the Aspen Institute, became the first agency in Houston to convene dozens of local and regional organizations in a post-Harvey discussion of the disaster and lessons learned.

I look forward to the day when libraries are fully recognized for the unique and irreplaceable service they provide to their cities and counties. The public recognizes this: The Pew *Libraries 2016* study found that 66 per cent of Americans said that closing their public library would have a major impact on them personally or their family (Horrigan 2016). I hope one day we can say a similar percentage of city and county leaders agree.

3.4.10 The Struggle of Library Education

I sat in a meeting over 15 years ago where a revered and now deceased library school faculty member declared that "library education is dead." I was shocked at the time because I could not see how that was true as I was then the administrator of a library system with over 30 branches serving over a million people in southern California and we were constantly hiring MLS candidates. By that time, several library schools had been discontinued and we were seeing the consolidation of students in large programs in various parts of the country and a near-universal trend toward fully online or hybrid programs. These years later, however, library education is far from dead and needed now more than ever.

I watched the work of two programs in California and I see the efforts of our three campuses in Texas from my perspective, it seems some of these programs tend to lean heavily toward information management, which is great for certain aspects of the profession. Several of our records management professionals came to us from these programs and their training is top-notch. But I worry that library school does not always provide the full range of skills needed for contemporary public library work. Is there an adequate emphasis on community engagement, political advocacy, and marketing services through segmentation analysis? Are the programs

sufficiently grounded in principles of social justice? Do students understand the potential impact of the public library? Are they taught to be innovators and change agents? Are students prepared for real-world challenges while also receiving a grounding in professional ethics and values? It seems vitally important that future professional librarians be prepared to lead libraries that are confronting the effects of the broad social challenges discussed above such as the authenticity of the information, the erosion of public trust in institutions, and income inequality. I know many very talented libraries school faculty so I have faith in the ability of individual teachers to the extent they can develop their content. But I worry about programs that have to keep enrollment numbers high to generate their income and what sacrifices such programs make to be competitive with other departments. Library schools must recruit diverse students and train them to deal with the challenges of running and managing their library programs in ways that remain competitive and viable.

3.5 CONCLUSION

Library and information services in the changing information scenario have taken a sea change providing innovative and value-added services. There is a complete transformation of libraries and reorientation of library professionals associated with this. The backbone of this development has necessitated the schools of library and information studies to create appropriate human resources to meet the challenges of the emerging knowledge society. Schools of library and information studies will continue to face the challenges of the digital era. These challenges can be met only when the educators, practitioners and researchers of the library and information profession work together and bring qualitative improvement through a curriculum which has a great impact on workplaces. The LIS schools not only aim at balancing traditional librarianship and technology but do a lot to make the students exposed and develop expertise in different areas of information and communication technology and its application in library and information centers. The emerging areas of ICT are compelling the library and information schools to revamp LIS education in the country, draw a road map to achieve its mission and prepare a vision for the 21st century. Public libraries are at a critical juncture. The continuing success of the institution lies in how we manage through these challenges. These larger social trends are not within our control, but how we respond is. Despite these difficulties, the time has never been better to be a public library director or staff person. We have weathered the worst of the threats against us and so long as we maintain our integrity, determination, and commitment to our professional mission and values, we believe the public library will endure and thrive long into the future.

3.6 SELF-ASSESSMENT QUESTIONS

1. Defining transformation and digital transformation in the LIS profession, is very necessary to give examples.
2. What challenges are facing the LIS profession in Pakistan?
3. Describe the opportunities available to the LIS profession in Pakistan.
4. How are libraries transforming their services and function in the current ICT era?

ACTIVITY:

1. Prepare a case study of challenges to university libraries of Pakistan

RECOMMENDED READING:

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Unit-4

PREPARING FOR TRANSFORMED LIBRARIES IN THE 21ST CENTURY: CHANGING LANDSCAPE

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INTRODUCTION

After going through this unit, learners should get acquainted with the concept of disruptive technologies. In the first part of the unit, we elaborate on changing landscape of library, their collection and services because of disruptive technologies that surround libraries as well as other industries. We also go into detail on changes in information-seeking behaviour of users, print and electronic publishing and its impact on libraries. The unit also describes public perceptions and assumptions about libraries and how libraries can take advantage of them in their new avatar with new roles and services. Part II of this unit will elaborate on new roles, skills and strategies that librarians are required to possess for handling transformed libraries in the 21st Century.

OBJECTIVES

The objectives of this unit are to impart knowledge of the following aspects of transforming libraries:

1. Disruptive technologies are disrupting all essential components of the library.
2. Changes in information-seeking behaviour of users.
3. Changing landscape of library collections, and
4. Assumptions about libraries and how to reposition libraries and library services concerning these assumptions.

4.1 INTRODUCTION

Libraries remained the most important publicly available source of authentic information for centuries. However, the scenario has changed abruptly with the emergence of the Internet, particularly, the World Wide Web (WWW) as a new media of information delivery, which, in turn, triggered a proliferation of Web-based full-text online resources from diverse sources. While an increasingly larger number of traditional publishers, scholarly societies, university presses, etc. are using the Internet as a global way for offering their publications to the international community of scientists and technologists, thousands of individuals, associations, entrepreneurs, and organizations are also publishing their information on the Web. The World Wide Web (WWW) has become a de facto media of information delivery of Web-based full-text online resources and databases. The availability of web-based electronic resources is exerting ever-increasing pressure on libraries, which, in turn, are committing larger portions of their budgetary allocation for accessing web-based online full-text databases or procuring online products and services. In the backdrop of the scenario described above, libraries are undergoing a transformation with an infusion of web-based electronic resources, a reduction in print acquisition and irreversible technological interventions. In today's information era, web search engines, such as Google and Yahoo, challenge the position of libraries as a leading source of information. However, information that is found through Google may not pass the test of integrity, authenticity and authority. Today's era is known as Information and Communication Technology era. Every aspect of human life is affected by ICT. The applications of Information and Communication Technology (ICT) in libraries have brought revolutionary changes in the entire concept of library operations, services and management. Today, modern libraries are not equipped with print books and journals but also with CD-ROM Databases, Digital Video Discs, Electronic Databases, Consortia, e-books and e-journals etc. Hence libraries have been transformed from traditional libraries to hybrid libraries having print, electronic and online resources. So, the library and information science professionals used to get ready to face the challenges emerging due to the adoption of newer technologies. An attempt has been made in the present volume to synthesize all aspects of library and information science and ICT and to put them in systematic order in one place to understand the conceptual phenomena and to render better and more effective services to the patterns. This book not only deals with the theoretical aspects of different topics but there are also some case studies which show the path to march forward. The emergence of the Internet as a new media of information delivery, digitization, Innovations in agricultural information systems, plagiarism, farm advisory services, RFID, Barcode technology, KOHA, Moodle, etc., are the current emerging feature of libraries and librarians are preparing to adopt these technologies and transforming LIS profession.

Libraries hold and disseminate materials that often reflect the social and cultural needs of the community. As well as reflecting the specific needs of the community, they also contribute to

a globally connected knowledge base and collection of cultural heritage. The more community-centred library can both enhance community assets while at the same time actively contributing to a broader network of libraries and cultural institutions. Public libraries have traditionally been places “anyone” could visit within limitations. Society has become global, less prejudiced and more tolerant of difference. It is therefore important that in the future the library repositions itself as a centre for social inclusion for people from all backgrounds. Librarians must practise being facilitators and connectors between the diverse members of the communities they serve rather than just being information experts.

4.2 DISRUPTIVE TECHNOLOGIES IN LIBRARIES

The word “disruptive technologies” was first coined by Clayton Christensen in his book entitled “Innovator’s Dilemma: When New Technologies Cause Great Firms to Fail”. Christensen developed a theory for why mainstream, established, well-managed and successful firms fail when newcomers selling inferior but more modern and scalable technology entered the market using the complete history of the disk drive industry.

Disruptive technology refers to new or enhanced technology that either replaces or disrupts an existing technology, making it obsolete or redundant. Disruptive technologies are designed to succeed existing technology with improved functionalities. The technology applies to all walks of life including hardware, software, networks and converged technologies. The advent of the Internet, for example, has made the printed format of scholarly communication redundant and obsolete. Indexing and abstracting services like Index Medicus, Chemical Abstracts, Biological Abstracts and Engineering Index have disappeared in print and are used sparingly online. Journals are preferred in e-format and print versions are disappearing gradually. Likewise, books are increasingly appearing in e-format coinciding with the disappearance of their print counterpart. Moreover, users, especially youngsters are preferring electronic versions of publications in preference to their print counterpart.

Several disruptive technologies are now available as alternatives to various services of libraries challenging the very existence of libraries. Let's look at some of the important examples of disruptive technology.

Library Service	Disruptive Technology
Search Everything	Google, Yahoo, NetFlix, SiteSeer, PubMed Central, etc.
Catalogue	Library Thing, Google Books, Good Reads, etc.
Journals	Open access journals, SiteSeer, DOAJ, Scitopia.org, SciHub, etc.

My Account / Citation Guide	Zotero, Endnote, Mendeley, etc.
Site Search	Google
Distance Learning Services	You Tube, SWAYAM, E PG Pathshala, MIT Courses, Coursera, edX, Ask
Pathfinder, Guide to Internet Resources	IPL-2, Intuit, etc.
Digital Collections	ArXive.org, Flickr, Photomuse, Digital Commons, JSTOR
Ask-a-Librarian	Yahoo Answers! AmazonMechanical Turk, Ask

Disruptive technology is not only affecting libraries, but it is affecting all walks of life. In a speech, Dieter Zetsche, Managing Director of Daimler Benz stated that “Our competitors are no longer other car companies but Tesla, Google, Apple and Amazon”. Uber is just a software platform, it does not own any cars, and is now the biggest taxi company in the world. Likewise, Airbnb is the biggest hotel company in the world, although they do not own any properties. The software will disrupt every sphere of human activity in the next decade, ranging from medicine, agriculture, industrial manufacture, transportation, home appliances and warfare. It is predicted that by 2030 computers will become far more intelligent than humans and will develop the ability to acquire knowledge by themselves, learn from their mistakes and improve their abilities. Some of the important disruptive technologies are as follows:

Disruptive Technology	Disrupted Technology	Obsolete Products / Services
Automobile Industry	Autonomous cars: Self-driving cars	Automobile Industry
Digital Camera	Film-based Cameras	Camera films (Kodak)
Smart Mobiles	Traditional Mobiles	Nokia, Blackberry, etc.
Transportation	On-demand Transportation	Yellow Taxi
MP3 Players (iPod)	Walkman / Audio Cassette Recorders	Sony, Panasonic, etc.
MOOCs / Online Education	Airbnb: Pooling residential accommodation for vacation rental booking	Hotel Industry

4.3 INFORMATION REQUIREMENT OF A USER IN AN ACADEMIC INSTITUTION

Let us now examine the information requirement of a user in an academic institution and how can libraries design their services to match his or her requirements. Typical requirements of a user from a library are as follows:

- Access to books, journals, conference proceedings, manuscripts and other print and non-print materials available within the four walls of a library or outside the library through Library OPAC or external databases.
- Timely access to research works by his peers and contemporaries duly filtered to include articles from qualitative journals.
- A self-serve online environment with support in terms of library portals, federated search interfaces, resource selection aids, etc.
- Seamless access to subscribed e-resources anytime, anywhere, anyway (open access / subscribed) using access management technology such as EZ proxy, Athens or Shibboleth.
- Guidance in publishing his / her work in high-impact journals and assist in the analysis of his / her research output on various performance parameters, and
- Access to research funding opportunities.

4.4 HOW DO USERS ACCESS INFORMATION?

Although the libraries are seen as providers of reliable information, most users start their searches with a search engine like Google and not with library portals. Fee-based content, even if accessible through library portals, is losing its value-added edge. Wikis are much more popular even for scientific information in comparison to fee-based information products published by international scholarly publishers.

The striking difference in preferences and information-seeking behaviours is observed based on the functional roles and domain knowledge of librarians and users. In a survey on information-seeking behaviour and preferences, librarians and scientists were asked to name the top scientific and medical search resources that they use or are aware of. The difference is startling. While the scientist preferred Google, Yahoo and PubMed as their primary choice, the librarians choose ScienceDirect, Web of Science, MedLine, JSTOR and Springer.

In a study conducted by OCLC in 2005 majority of online information consumers (82%) began their searches for information on a search engine (including 62% on Google), a source they found roughly as trustworthy as a library and only 1% began their searches on a library Web site. The OCLC repeated the same study in 2010 and found that e-mail (94%) and search engines (92%) still lead as the most widely used online resources with usage rates for both services jumping up almost 30% when compared to our 2005 study results. Half of Americans report using e-mail alerts as a primary means of receiving news and information. E-mail and search engines have achieved near-ubiquitous status among online Americans, and social networking and social media are quickly catching up.

4.5 TODAY'S USER: HIGHLY AWARE AND IT SAVVY

Before attempting to re-design library services and activities to suit the requirement of today's user, it is important to note that today's user is highly aware and computer savvy. They have a greater opportunity to use web-based resources than the library staff. Users do not have time or patience for unauthenticated information. They prefer electronic access to e-resources for the convenience it offers. Most users can independently search and access information available through Web-based products and services accessible to them on their Desktops. They are impatient and demanding and expect Library to provide expeditious and efficient service. Users demand highly specific and timely information on varieties of devices such as desktops, laptops, tablets and smartphones.

In the background given above, today's user prefers to work independently, however, they would like to interact with librarians who have:

- Domain/subject expertise with the ability to provide in-depth and extensive assistance,
- Knowledge of research methodology,
- Awareness of publishing trends & publishing channels,
- Knowledge to assess information quality, credibility and accuracy, and
- Trained in techniques of information retrieval.

Librarians are required to prepare, train and equip themselves for the above-mentioned specializations.

4.6 CHANGING LANDSCAPE OF LIBRARY COLLECTION: FROM PRINT TO DIGITAL

The web has witnessed tremendous growth in the quantity of all types of publications. It has grown to encompass a variety of information sources - electronic journals, electronic books, digital repositories consisting of electronic pre-prints and post-prints, technical reports, online databases, library catalogues, educational materials, career sources, information on organizations, associations, etc. The advent of electronic journals, electronic books, web-based databases and other electronic information products are continuing to threaten the traditional practices and policies of buying, storing and accessing journals in libraries on the basis that "someone may need it someday" triggering a shift in the acquisition process from the policy of "just in case" to "access when you need". In the current information era led predominately by the Internet and Web technologies, the users prefer information products and services that can be delivered to their desktops. Although a wide variety of e-resources are available on the web, electronic journals and electronic

books continue to dominate the world of academics. As such evolution of e-journals and e-books is described briefly.

4.6.1 Evolution of Electronic Journals

The use of computers for information storage and retrieval activities began in the early 1960s in an offline, batch processing, a tape-oriented mode for collection, organization and storage of vast amounts of bibliographic data for printing of indexing and abstracting services and for production of computer generated and printed indices of these services. Gradually, computers were being used for phototypesetting and other operations relating to publishing. With the advent of microcomputers and e-mails, manuscripts were submitted as attachments to e-mails and publishers would apply their skills in quality management, presentation and layout design of articles that are already available in machine-readable form. As such, full-text online journals were available through online hosts like DIALOG and STN for the past several decades. “Mental Workload”, released in 1980, can be considered the first full-fledged electronic journal published by the New Jersey Institute of Technology and funded by the National Science Foundation.

In the 1980s, a journal entitled “Computer-Human Factors” was produced under the project, Birmingham Loughborough Electronic Network Development (BLEND) which resulted in two issues of “Computer-Human Factors”, each containing two referred articles. However, both these journals failed to publish subsequent issues electronically. In 1987, Syracuse University's e-journal “New Horizons in Adult Education” appeared that was being distributed by the BITNET, a US University network, along with a handful of other e-journals produced at universities in the late 1980s and early 1990s. Internet-based electronic journals started appearing at the beginning of 1990. These journals were mostly delivered as an attachment to e-mail while their back issues were mounted on anonymous ftp sites and users were required to download them from these FTP sites. The libraries and information centres made them accessible through their gopher site. Several electronic journals which began publication in 1990 included “Public Access Computer Systems Review”, “Journal of the International Academy of Hospitality Research”, “Postmodern Culture”, “Current Cities”, etc.

The mid-1990s also witnessed a major trend in which the commercial and university presses offered simultaneously electronic versions of their established print journals to the subscribers free of cost. By mid-1990s Elsevier, Wiley, and Springer started piloting e-journal systems. The web was still in its infancy and accessible mostly through university networks. Every academic institution was not wired, and graphics could not be displayed with a sharpness comparable with the print publication. As a result of this uncertainty, many publishers provided free access to the online equivalent of journals held by libraries

in print. John Hopkins created project MUSE in 1995, seeing the promise of the web even at that early stage. Several publishers offered their journals through home-grown interfaces, and several others opted to outsource the hosting of their e-journals to interface platforms such as HighWire Press, MetaPress and IngentaConnect. More transient but equally appealing access to e-journals for users came from aggregated collections such as EBSCOhost, Gale Expanded Academic ASAP, and ProQuest Research Library. These entities provided the facility of federated searching across thousands of e-journals, yielding a set of full-text results. These services became common in the late 1990s and currently are a staple of most academic library offerings. Like print journals, current and archival issues of electronic journals can be browsed through their content pages. Moreover, e-journals can also be searched not only on their metadata but also in a full text through a sophisticated search interface. UlrichsWeb: Global Serials Directory lists 300,000 journals including 70,813 online electronic journals, 11,270 open access journals and 43,396 refereed / peer-reviewed journals as shown in the Table given below.

Total Number of Titles	300,000
No. of Open Access Journals	11,270
Journals Indexed or Abstracted	44,739
Web Site / URL Listed	18,910
Online Electronic Journals	70,813
Journal Available in Electronic Format Only (print-independent)	16,475
Refereed / Peer-reviewed	43,296

4.6.2 Electronic Books

As stated by Clifford Lynch (2001) it is suspected that more words are being published about the e-book phenomenon in print than have been placed into e-books so far”, said That was about two decades ago, when the web was still its infancy and accessible mostly through university networks. However, subsequent technological developments include e-book hosting platforms, e-book readers and tablet devices such as iPad, Kindle, and Nook. Kobo Aura, Onyx, etc. have transformed the trade of the publishing industry. E-book hosting platforms, e-books readers and audio books are being used by the publishers to increase their penetration to larger audiences. An increasing number of books are now also available in digital format. Almost all publishers have digitized the backlist of their printed books and made them accessible in the electronic platform in addition to recently published books except for textbooks where publishers prefer a print format with a large number of students as their targeted buyers. Pearson, a leading publisher of educational books is the first to phase out print textbooks. John Fallon, the CEO of Pearson giving an interview to BBC News, 2019 said “We are now over the digital tipping point. Over half our annual

revenues come from digital sales, so we have decided that it is time to flick the switch as to how we primarily make and create our products”. It is hoped that this move would make more students buy its e-textbooks which are updated continually.

Ever since the Kindle was released in 2007, digital sales have consistently increased by double-digit figures. In 2011, Amazon reported that purchases of electronic books had surpassed those of print books. However, this trend was reversed in 2016 with sales of physical books increasing by 4% in the UK last year while e-book sales shrank by the same amount. Fig. 1 below shows that the number of e-books sold in the US has increased from 69 million in 2010 to 266 million in 2017.

More and more books are now being released on the web through enhanced interfaces that offer features such as increased search capacity within a book or entire collection of books, the ability to highlight and flag a page, the ability to make notes on text without damaging the book, ability to e-mail quotes from the books to other colleagues, etc. Most publishers like Springer, Wiley InterScience, Taylor and Francis, Cambridge University Press, Oxford University Press, etc. offer their e-book collections on a subscription / one-time purchase basis. Besides, there are several e-book aggregators that make thousands of books available online for libraries and individuals at a relatively lower cost. Three major e-book aggregators are Questia (<http://www.questia.com/>), Ebrary (<http://www.ebrary.com/>) and NetLibrary (<http://www.netlibrary.com/>).

However, just like other e-resources, e-books come with restrictions such as a limit on downloads, in terms of several pages, i.e., one page at a time or one chapter at a time or no download at all. As per the forecast of the e-book market by Research and Market in 2019, revenue from ebooks is expected to increase from US\$13,669 million in 2019 to US\$15,231 million by 2023 at an annual growth rate of 2.7%. Whereas user penetration would increase from 12.9% in 2019 to 14.5% by 2023. In global comparison, a sizable revenue is generated in the United States (US\$5,487m in 2019).

In addition to recent electronic books released by the publishers, Google under their project “Google Books”, also known as “Google Book Search” or “Google Print” has scanned millions of books that can be searched full text. The books under the project are either sourced directly from the publishers or their authors or through Google’s library partners. The number of books scanned under the Google Books project has grown to an estimated 25 million. It is estimated that there are about 130 million distinct book titles in the world, and Google intends to digitize them all.

It is a fact that digital publications are quick to produce, easy to access, and offer many features that print publications cannot provide. Moreover, online electronic books offer a more cost-effective and powerful solution than print books. It has also been established in several studies that e-books are less costly to purchase and maintain in comparison to printed books considering the cost of heating, cooling, shelving, and maintenance. Moreover, electronic books are used more often in comparison to print books since they are hosted on familiar platforms along with e-journals and other resources. Despite rising e-book sales and readership in recent years, it is believed that e-books are not yet positioned to replace print books. Both print books and e-books have unique attributes and serve distinct functions to meet people's reading needs, which may vary by individual demographic, contextual, and situational factors.

4.7 ASSUMPTIONS ABOUT THE LIBRARY:

David W. Lewis, Dean, IUPUI University Library, Indianapolis (Lewis, 2007) made the following five assumptions about libraries to examine their sustainability in their present format and to prepare libraries for the next generation.

4.7.1 Assumption 1: Libraries are Means, Not the End:

A library in an academic institution is a kind of subsidy that is provided to its users for carrying out study and research on its missions and objectives. Likewise, a public library is a kind of subsidy that is provided to the people and communities for making them better informed and well-read citizens. The information contained in the library cannot be shared and used in efficient quantities. However, when a better subsidy mechanism than libraries become available, they will be preferred. As such, it should be our endeavour to find strategies that provide the most value for the subsidy made available to the libraries. The libraries should encourage open access as an alternative method of publishing and set up institutional repositories, open access journals, etc. Moreover, a study should be undertaken to produce more scholarly content with the current investments in libraries.

4.7.2 Assumption 2: Disruptive Technologies are Disrupting Libraries:

As mentioned in point 3 above, disruptive technologies are not only disrupting libraries and library services, but it is also affecting all walks of life. A plethora of disruptive technologies are now available as an alternative to various services of libraries challenging its very existence.

4.7.3.1 Assumption 3: Real Change Requires Real Change:

The process of imparting education is going through a paradigm shift. Libraries cannot make incremental adjustments and marginal changes to cope with the paradigm shift. New

technological tools and techniques will have to be evolved since it is not possible to keep doing today's job with yesterday's tools.

4.7.4 Assumption 4: We have a Window of Opportunity:

Libraries are considered as a hub of all academic activities. Sarvepalli Shri S. Radhakrishnan, Former President of India said that “a university is a string of buildings around a library”. However, this opportunity will not stay open forever. Alternatives will be brought in force as and when available.

4.7.5 Assumption 5: Funds Available to Libraries / Institutions are Limited:

Libraries are getting limited funds whereas subscription rates of journals and the average price of books have increased exponentially in the past five decades. As of now, the increase in subscription rates of journals is much higher than the general inflation rate, i.e., 273% increase from 1986 till 2003. An increase in library budgets will not be greater than the rate of general inflation. As such, buying power of libraries would decrease gradually year after year.

Because all the building blocks of libraries are undergoing the process of irreversible transformation, what could libraries do to be more relevant in the future than they were in the past? Whether libraries can counter these changes through incremental changes in their services or does it require a paradigm shift in services, expertise and role a librarian is required to play in transformed libraries of the 21st century?

4.8 CONCLUSION

Libraries are undergoing a transformation with an infusion of web-based electronic resources, reduction in print acquisition and irreversible technological interventions. In today's information era, web search engines, such as Google and Yahoo, challenge the position of libraries as a leading source of information. This module, in its first part, elaborates on changing landscape of library, their collection and services because of disruptive technologies that surround libraries as well as other industries. It elaborates on changes in information-seeking behaviour of users, print and electronic publishing and its impact on libraries. It elaborates on public perceptions and assumptions about libraries and how libraries can take advantage of them in their new avatar with new roles and services.

4.9 SELF-ASSESSMENT QUESTIONS

1. Define disruptive technologies and discuss essential components of these technologies.
2. What is information-seeking behaviour? Explain various models of information-seeking behaviour.
3. Describe the changing landscape of the library collection.
4. How do libraries reposition their services in changing landscape? Explain.

ACTIVITY:

1. Visit a nearby university library and report the impact of disruptive technologies impact on its services.

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Unit-5

PREPARING FOR TRANSFORMED LIBRARIES IN THE 21ST CENTURY: NEW ROLES, SKILLS, AND STRATEGIES

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INTRODUCTION

After going through this unit, you should get acquainted with the basic functions of a library in changing scenarios. They would learn about “innovation” and elements that facilitate innovation. Learners would get acquainted with several new roles that a librarian would be required to perform with strategies and skillsets required for performing these new roles. This unit is the second part of the previous unit, which elaborates on the basic functions of a library that it must facilitate including i) Read and Learn; ii) Meet and Discuss; iii) Shape and Develop; iv) Support Serendipity and Inter-disciplinary Research; and v) Collaborate with Users. This is also elaborating on “innovation” and elements that facilitate innovation. Lastly, the module elaborates on new roles, skills and strategies that librarians are required for handling transformed libraries in the 21st Century.

OBJECTIVES

After studying this unit, you will be able to understand:

1. Basic functions of a library in changing scenarios.
2. Innovation and elements that facilitate innovation, and
3. New roles, skills and strategies that librarians are required for handling transformed libraries in the 21st century.

5.1 INTRODUCTION

As discussed in the previous unit libraries remained the most important publicly available source of authentic information for centuries. However, the scenario has changed abruptly with the emergence of the Internet, particularly, the World Wide Web (WWW) as a new media of information delivery, which, in turn, triggered a proliferation of Web-based full-text online resources from diverse sources. While an increasingly larger number of traditional publishers, scholarly societies, university presses, etc. are using the Internet as a global way for offering their publications to the international community of scientists and technologists, thousands of individuals, associations, entrepreneurs, and organizations are also publishing their information on the Web. The World Wide Web (WWW) has become a de facto media of information delivery of Web-based full-text online resources and databases. The availability of web-based electronic resources is exerting ever-increasing pressure on libraries, which, in turn, are committing larger portions of their budgetary allocation for accessing web-based online full-text databases or procuring online products and services.

In the backdrop of the scenario described above, libraries are undergoing a transformation with an infusion of web-based electronic resources, a reduction in print acquisition and irreversible technological interventions. In today's information era, web search engines, such as Google and Yahoo, challenge the position of libraries as a leading source of information. However, information that is found through Google may not pass the test of integrity, authenticity and authority.

A manager must exercise a unique set of skills. Similarly, at various levels, you require different types of skills. Let us start by mentioning the skills required at the technical skill, human skills, conceptual skills, leading skills, planning level, organizing skills, control skills, and decision-making skills. These skills refer to the personal ability put to use by the manager in a specific position that he or she holds in the organizational hierarchy.

As one moves up in the hierarchy of managerial positions, the responsibility increases. The fundamental functions of a manager such as planning, organizing, leading, controlling and decision-making are the skills required to be mastered by the managers. To exercise these functions, one has also to keep in mind, the type of job, the size of the organization, the skills and experiences of the people one works with and the time available at his or her disposal to do these management functions.

According to Katz (1974) talks of three types of skills that are recognized by all managers. These are the technical, the human and the conceptual skills. The use of these skills differs for various levels of managers. Let us understand the skills first and then see how much each skill is used at

various levels of managerial hierarchy and what importance each has in the career growth of a manager.

5.1.1 What is a Librarian? Key Roles and Duties: Librarians can provide organization and many other benefits to an institution. Read further to learn more about the roles and responsibilities of a librarian, areas of speciality, qualifications and other important information to help you hire your librarian. A librarian is responsible for overseeing the daily operations of a library at the public or private level. They can work within schools, religious institutions or as part of government-owned libraries and research facilities.

5.1.2 Roles and Responsibilities of a Librarian: Librarians can have diverse responsibilities. Here are some examples of potential roles and responsibilities a librarian might have, as mentioned below:

1. Provide customer service for library users
2. Provide suggestions to library users about new books to try
3. Help library users check out books
4. Keep a budget to repair, replace or get new reading materials
5. Oversee a team of assistant librarians and library aids
6. Delegate tasks among staff to maintain a productive work environment
7. Create an online database for easy access to members and staff
8. Catalogue new inventory and update the database accordingly
9. Develop fun and education programs for youths and adults
10. Research new reading trends and popular genres to add to the library
11. Order new inventory from book supply companies.

5.1.3 Types of Librarians: There are several different kinds of librarians with unique roles within their community. Here are some examples of different librarian titles:

- **Public Librarians:** Public librarians work at public libraries located within a town, city or state. Here, they interact with members of the public of all ages, including children, adolescents, adults and the elderly. Public librarians help organize their library, catalogue new reading material and enter new book details into their library database. In addition, public librarians can create community

programs that take place in the library. These could include library-run book clubs, puppet shows and even fun events where local authors read from their books.

- **School Librarians:** School librarians can work in public or private schools at the elementary, middle and high school levels. At the school level, a large part of a librarian's job might be to educate students on how to use a library effectively and help instil a love for reading in them. As part of classes, they might teach children how to use the library database and other research tools like an encyclopedia, dictionary or thesaurus.
- **Academic Librarians:** Academic librarians are those who work within colleges and universities. Here, they help students learn how to use the library database to find online scholarly articles or hardcopy materials for research papers and projects. They also help professors find and access research material and sometimes hold materials for them to use in their classes. Depending on the age of the college or university, librarians might also be tasked with storing and preserving artefacts and books. They might be responsible for scanning pages of old books to add to their online database to provide access to library users while ensuring its preservation.
- **Speciality-Focused Librarians:** Specialty-focused librarians work within speciality libraries. A speciality library contains books and reading material of the same genre or about the same industry. These libraries are typically located within colleges or universities or at the public level in places like zoos and even museums. In addition, government agencies can also have libraries that include research tools and historical records. For example, speciality librarians who work in law school libraries are responsible for maintaining books and other reading material pertaining specifically to law.

5.1.4 Librarian Qualifications/Requirements: Librarians can have varying requirements depending on where they work. Here are some basic qualifications a librarian should have.

- **A Bachelor's Degree:** Librarians usually complete a four-year bachelor's degree in library science or another area such as English, history or sociology. Librarians can also have degrees in an area they hope to specialize in. For example, a pre-law degree could translate to working in a law library after completing their master's degree.

- **Relevant Work Experience:** As students complete their bachelor's and master's degrees, many gain work experience within a library or research facility. Some might get positions working in their college or university library as an aid or obtain a position as a research assistant.
- **A Master's Degree:** After completing a bachelor's degree, prospective librarians typically complete a two-year master's degree program in library science or library and information studies. This is especially helpful if they did not get a bachelor's degree in library science.

5.2 BASIC FUNCTIONS OF A LIBRARY

The role of academic libraries is to stir curiosity, inspire and provide affordable access to authentic information to create a literate environment with well-informed students and faculty. Libraries provide information resources to their users to “read and learn”, physical space to “meet and discuss” with fellow users and an opportunity to “shape & develop” their careers. Libraries also support serendipity and Inter-disciplinary research. Some live examples of serendipity research are as follows:

- German chemist Friedrich August Kekulé (1865) discovered the ring shape of the benzene molecule after having a daydream of a snake seizing its tail.
- Alexander Fleming noticed a petri dish containing Staphylococcus culture, which was mistakenly left open and was contaminated by blue-green mould (fungi), which, in turn, inhibited bacterial growth around the mould.
- A pharmaceutical company in the US had identified several chemical formulations that were inherently unstable. If these chemical formulations could have stable states, they could be potential candidates for curing several debilitating diseases.

The library is a service organization and provides services to its users in its basic function following are some common functions of a library:

1. Providing sources of information necessary for faculty members, students and workers, as well as the local community.
2. Organizing information sources and arranging them so they can be stored and retrieved to take advantage of with less effort.

3. Borrow library materials to beneficiaries and providing places for reading.
4. Answer questions and inquiries received by the library, whether they are internal or from outside the academy.
5. Contribute to developing and supporting libraries in Jordan through gifting, exchanging information and cooperation with other libraries.

Moreover, depending upon the type of library it can have very different functions. Most libraries offer these functions:

1. A place (physical or digital) to gather information in various formats (information can be for entertainment or education).
2. Librarians who can help you find information (and maybe how to evaluate its accuracy and usefulness).
3. A place for a community to come together (for events or programs or maybe offer shelter).

5.3 NEW ROLES, SKILLS AND STRATEGIES FOR LIBRARIANS

The libraries of the future will have a changed role to play in an academic institution. As such, library staff of the future would be required to possess a different mix of skill sets in the age guided by “access” that are very different from those that were imbibed into them in the age of “acquisition”. Let's delve into the new role of librarians and library staff in the changing environment.

5.3.1 Reorganize Learning Spaces

There will be increasing demand for library space since it occupies a prime location in an institution. Library space, being prime locations in an institution, will increasingly be used less for storing books, journals and other documents and more for other purposes such as discussion rooms, multimedia facilities, gaming rooms, product development facilities, etc. to promote learning, interaction and collaboration amongst students, researchers and faculty. Since repurposing library space is one of the key features of future libraries, it would be essential to re-develop available spaces, phase-out legacy print collections and

provide access to electronic resources. Scandinavian Library Quarterly brought out a special issue on Library Space in 2013 that provides updates on space re-organizations in public and research libraries in Scandinavia. Massachusetts Institute of Technology released its Preliminary Report of the Institute-wide Task Force on the Future of Libraries on October 24, 2016, with emphasis on the reorganization of library space.

Strategies required: Re-develop available physical spaces, digitise legacy print collections and phase-out print material once digitized, move from the acquisition of printed documents to electronic resources and provide access to them on the network.

Skills needed: Negotiation, aesthetics, imagination, assessment of user's requirements.

5.3.2 Creating Metadata and Linked Data

Librarians were the first inhabitants of the world wide web with their instinct to organize and structure the information sources scatter over thousands of websites on the Internet. The librarians started creating virtual libraries and pathfinders consisting of links to important electronic resources available on the Internet for a fee free. Librarians possess instinctive skills in knowledge organization using thesaurus and subject headings as standard vocabulary. It may however be noted that major developments in metadata creation have taken place outside of libraries, in the commercial database or portal world, and this trend is likely to continue unless the librarians take up the task themselves to break this trend. As such, it would be desirable that the libraries build partnerships with the research community in a digital library, metadata creation and extraction, semantic web applications, etc. However, this would demand new skill sets since the role of librarians concerning metadata will be vastly different from their old cataloguing role.

The Preliminary Report of the Institute-wide Task Force of MIT 2019 on the “Future of Libraries” opined that the key priority for the “library as a platform” will be to make open standardized metadata for library collections accessible via public application programming interfaces (APIs). The Task Force recommended that the MIT Libraries play two roles: i) as a core developer of new tools for computer-assisted research methods and novel forms of information discovery; and ii) as key support for and convener of developers around the world who is working on new ways to interrogate scholarly resources, discover resources in our collections and elsewhere, and help scholars linked by common interests discover one another.

Strategies Required: Create imaginative metadata to increase precision, recall and discovery of library resources, construct RDF-based thesaurus and ontologies for web-based search services, etc.

Skills Needed: Metadata creation using controlled vocabulary, thesaurus and ontologies construction, domain knowledge.

5.3.3 Reposition Library and its Resources

Libraries are required to reposition themselves, their resources and services where the users are. Libraries should create ‘Face Book’ sites to facilitate information searching and social exchanges and integrate their discovery services with Google and open their catalogue to Google.

Moreover, libraries would be required to broaden the catalogue of resources that they provide to support teaching and learning. Libraries, till recently, were providing access to materials that they owned within four walls of their libraries. However, increasingly libraries are providing access to resources available beyond the four walls the library in digital form. The librarians will have to assume the role of providing integrated access to a range of digital information available to users through licensing agreements or through open access. Besides, providing integrated access to electronic resources that are subscribed to or those that are available in open access, the libraries should increasingly provide integrated access to non-traditional resources such as online e-learning materials, multimedia educational material, educational blogs maintained by experts, etc. Libraries should also facilitate the collaborative creation of content through Wikis and blogs and provide platforms to its users for online discussions. The library website should provide a facility for “My Accounts / My Space” to users and have their presence on social networks. As such, librarians and library staff should develop the skills and expertise required for their new Avatar.

The Strategy Required: Reposition library and information tools, resources, and expertise, develop new skills and expertise.

Skills Needed: Web 2.0 and 3.0 technologies, integration of library resources with Google, web discovery services and federated search technology.

5.3.4. Library Everywhere

Library resources and services should be available anywhere and everywhere. As such, the library should provide faster Internet connections, in-campus as well as off-campus access to resources using access management technologies such as Shibboleth, EZproxy, etc. The library should also provide outreach activities to the depth and breadth of the university community and migrate its resources from print to electronic format. The library should increasingly provide services such as electronic reference service, real-time reference service, SMS service, RSS feeds, etc.

The Strategy Required: Migrate from print to electronic collections. Offer Virtual Reference Service, SMS Service and RSS feed.

Skills Needed: Access management technologies, web-based technological solutions for RSS integration, real-time and virtual reference service, etc.

5.3.5. Collect and Digitize Archival Materials

Digitization is the process of converting the content of physical media (e.g., periodical articles, books, manuscripts, cards, photographs, sound, video, graphics, animations, etc.) into a digital format using optical scanners and digital cameras. Collecting and digitizing archival materials offers a significant opportunity for libraries and librarians to assume the role of curating digital content. The librarian may assume the role of curator of an institute by setting up an institutional repository and collecting and curating all documents generated in an institute including published and non-published materials.

Strategies Required: Select and digitise legacy documents, set up institutional repositories to host digitized material, purchase or subscribe to digitized collections, etc.

Skills Needed: Evaluation of resources, digitization, setting-up institutional repositories, digital preservation and curation.

5.3.6. Choose Resources and Manage Licenses

The collection development process in the electronic environment has shifted the role of librarians toward managing licenses since a growing share of libraries' budget is used for providing access to scholarly resources through licensing agreements with publishers of electronic journals, databases, and other digital resources. The librarians will have to train themselves for reading between the lines and take utmost care of institutional interest. Each word in the license document will have to be well defined to avoid ambiguity. The clauses in the license document should cover all relevant terms and conditions such as perpetual access, geographic jurisdiction, payment clauses, annual increase in rates of subscription, back file access, discontinuation of individual journal titles, platform fee, etc. The library or parent organisation may also engage the services of a legal expert if required.

Strategies Required: Subscribe to e-resources preferably through a library consortium and manage e-resources and their licenses.

Skills Needed: Evaluation of resources, legal knowledge for managing licenses, etc.

5.3.7. Offer Virtual and Real-time Reference Services

Providing virtual and real-time reference services to individual users may fit into the emerging knowledge environment wherein libraries would increasingly have their collections in digital format accessible to their users within campus as well as outside the campus. As such, the users may have lesser requirements and opportunities to visit the library. Virtual and real-time reference services may also incorporate features of push technology where-in users may be prompted to subscribe to library feeds on various subjects and collections. The library may also offer their service to configure subscribed databases and full-text e-journals for alerting and RSS Feed services as per the subject profiles of individual users. The library website should incorporate appropriate icons for virtual reference service (Ask-a-Librarian) and real-time reference service (Chat-with-Librarian). The library website may also provide a link to payment-based services offered by other agencies.

Strategies Required: Adopt technological solutions for offering real-time and virtual reference services, chat-with-librarian, etc.

Skills Needed: Web-based technological solutions for RSS integration, real-time and virtual reference service.

5.3.8. Maintaining Digital Repositories

Although maintaining digital repositories requires skills that may go beyond the skills of librarians, however, if librarians take the responsibility of maintaining IRs, it may provide a solid foundation for the future of academic libraries. Besides, setting up an institutional repository, librarians may also take up the task of setting up a domain-specific institutional repository in a given discipline as per the overall subject mandate of /her institution. Institutional repositories may also be set up for a given type of resource such as theses, reports, standards and protocols. The librarian may also contribute towards providing additional features to the repositories as mentioned in the features of future libraries.

Strategies Required: Set up and maintain digital repositories.

Skills Needed: Installation and implementation of open-source software required for setting-up digital repositories.

5.3.9. Predatory Journals

Predatory journals are defined as an “open-access academic publishing business model that involves charging publication fees from authors without providing the editorial and publishing services associated with legitimate open access journals”. Jeffrey Beall was the

first to coin the word “predatory journals” and publish a List of Predatory Publishers and Standalone Journals, the archived version of the Beall's list is being maintained and updated by Weebly at <https://beallslist.weebly.com/>. Cabell's Blacklist is a web-based subscription service listing Blacklist and Whitelist of journals.

It is a librarian's job to educate faculty, researchers and scientist about predatory journals and help them to select quality journals for publishing their research.

Strategies Required: Learn about predatory journals and include them in information literacy programmes, organize writer's workshops, etc.

Skills Needed: Evaluation of journals and sources for identification of predatory journals.

5.3.10. Print Value

Future libraries would increasingly subscribe to electronic resources, digitize their legacy documents and phase out the print collection. However, the value of print cannot be ignored. Digitized print collections will have to be moved to dedicated storage facilities to preserve the collection for the long term in a controlled environment. Such dedicated central storage facilities will have to be created for a group of libraries with individual member libraries contributing their print assets to this physical repository. The collections deposited in such storage facilities can be borrowed by the member libraries or can be withdrawn by donating to the library if so required. The member libraries may also have enhanced ILL and document delivery services built around their print as well as electronic collections. The member libraries may also take collaborative digitization projects for digitizing their collections since it requires intensive funding that may go beyond the financial abilities of individual institutions. It may be noted that in the project on the Digital Library of India out- of-copyright books, manuscripts and other documents were digitized in several libraries in India with funding from Melon Foundation. These digitized collections are available online in open access.

Strategies Required: Set up common repositories of printed documents, collaborative digitization projects, etc.

Skills Needed: Digitization, setting-up collaborative cooperatives, etc.

5.3.11 Teaching Information Literacy

Imparting information literacy programmes would continue to be relevant in libraries of the future. However, information literacy in the e-environment would become more closely geared to users' needs and skills for supporting self-navigation and self-usage of online

electronic resources, databases, subject portals, etc. The librarians will have to develop their information literacy skills and tune them according to the requirement of individual users. They would be required to impart regular awareness programmes to users for promoting the usage of e-resources and undertake programmes for educating users on new technologies useful to them such as Wikis, RSS Feeds, Semantic Web, Listservs, Blogs, Mashups, etc.

The users should also be made aware of research output indicators that are used to measure the impact of research being carried out by individual scientists or their organizations such as Impact Factor, SJR, H-Index, i-10 Index, citations and mean citation score, etc. Researchers may also require extensive training in citation searching and the use of reference management software such as Zotero and Mendeley.

Strategies required: Organize awareness and orientation programmes on technological-based solutions for reference management, content management, e-learning, bibliometrics, etc.

Skills Needed: Web-based technologies, open-source application software, its installation and implementation.

5.3.12 Research Involvement and Deeper Collaboration with Faculty

Future libraries will be required to figure out means and methods that can be used to support faculty and students in their research and education. The library stands at the hub of the academic activities drawing faculty and students in the process of garnering knowledge and contributing to the existing pool of knowledge. In the changing environment, however, librarians and libraries are required to alter their identities about the changing modes of knowledge creation and dissemination. They are required to reposition the hub and figure out the kinds of services that they can provide to students, researchers and faculty to enhance their research productivity. Librarians are not trained explicitly to bring about such changes in library organization and culture. However, the only survival kit for libraries in the changing environment is to provide proactive support to the work of faculty and students. Some of the important jobs that the library can undertake to further the research and development work of an institution are as follow:

- Develop and maintain an institutional repository preserving the University's research output and add features and functionalities to incentivize students and researchers to upload their research work into the repositories. Such features may include reporting the number of downloads and citations received by a paper available in the repository, the API score of a faculty, linking a researcher's work with their identities, such as ORCID, Vidwan ID, Scholar's ID, as well as their profiles in Google Scholar.

- Launch new services and systems to support research and scholarship to establish deeper collaborations with faculty.
- Set up a Unit in Library with a dedicated library staff member as liaison to faculty to help them in project writing as well as in identifying sources of funding and writing of projects.

Strategies Required: Set up the institutional repository and add value-added features and functionalities.

Skills Needed: open-source solutions, Researcher's Identity providers, programming skills, domain knowledge, etc.

5.3.13 Measuring Research Output: Bibliometric and Citation Analysis

The quality and quantity of published research articles are considered one the important yardsticks of the success of individual scientists, researchers, and academic and R&D institutions. The regulatory bodies and funding agencies are increasingly using qualitative parameters and other performance indicators to allocate funds to R&D institutions. Librarians can, therefore, take the task of measuring performance indicators of their respective institutions in terms of research publications and their impact in terms of citations to sensitize academic administrators and authorities. Such studies may include a detailed analysis of research output, its impact (in terms of citation received and H-Index), focused areas of research of an institution, national and international collaborations, correlation between research output and its consumption, types of publications and highly cited papers, etc. using reliable and authentic data sources such as Web of Science or Scopus.

Strategies Required: Learn scientometric and bibliometric techniques.

Skills Needed: Scientometric and bibliometric tools and techniques, data visualization and use of citation indices.

5.3.14 Contributions in Research Assessment and World Ranking of Universities

Research assessment can play an important role in improving the performance and quality of academic institutions. The process of research assessment of an institution and world ranking of universities requires the management of research data called Research Data Management (RDM). The library is considered a natural place for RDM work because the library has been in the business of managing and curating research output for a long time as its core activity.

The OCLC, in its report published in 2009, concluded that the libraries in academic institutions play a significant role in the research assessment process through institutional repositories and databases of institutional research output.

Strategies Required: Learn nuances of research assessment and bibliometric techniques.

Skills Needed: Scientometric and bibliometric tools and techniques, Research Data Management and data visualization.

5.3.15 Promote Open Access and Support Implement Technological Solutions

Open access is gaining acceptance all over the world because of the unprecedently escalation of prices of scholarly publications. Promoting open access resources and open access publishing is an important role that a librarian can assume. Besides, librarians, being technology savvy, should also support the installation and implementation of web-based open source technological solutions including Content Management systems (Word Press, Joomla, etc.), Reference Management systems (Mendeley, Zotero), e-Learning Management systems (A ATutor, Moodle, Sakai), MOOCs (SWAYAM, edx, Coursera, Udacity), Research Information Management System (Vivo, Profiles, IRINS, Egle-I), e-Resource Management System (Coral, ERMes, 360 Resource Manager), Identity providers (Orcid, Microsoft Research ID, Scopus ID, WoS Researcher's ID), Google Apps, etc.

Strategies Required: Set up open access journals and repositories.

Skills Needed: Setting up and maintaining digital repositories, and open-source software.

5.4 CONCLUSION

Libraries are undergoing a transformation with an infusion of web-based electronic resources, reduction in print acquisition and irreversible technological interventions. In today's information era, web search engines, such as Google and Yahoo, challenge the position of libraries as a leading source of information. This module, in its second part, elaborates on the basic functions of a library that it must facilitate including i) Read and Learn; ii) Meet and Discuss; iii) Shape and Develop; iv) Support Serendipity and Interdisciplinary Research; and v) Collaborate with Users. The article elaborates on "innovation" and elements that facilitate innovation. Lastly, the module elaborates on new roles, skills and strategies that librarians are required to possess for handling transformed libraries in the 21st Century.

SELF-ASSESSMENT QUESTIONS:

1. Define library, librarian and basic functions of the library.
2. What is innovation, how do libraries and innovating their services and what are the elements that facilitate innovation?
3. Discuss the strategies, and skills required for librarians concerning transforming library services.

ACTIVITY:

1. Interview an academic librarian (University librarian) and judge his skills and roles in respect to providing innovative library services to users.

RECOMMENDED READING:

1. Beall, J. (2012). Predatory publishers are corrupting open access. *Nature* 489, 179, 2012.
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Unit-6

E-RESOURCE AND CONSORTIA MANAGEMENT

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INTRODUCTION

The unit is designed to explain the E-resources, various modes of subscription of E-resources and the situation of E-resources vs Print resources in libraries. It will also discuss the library consortia, various models of library consortia and the benefits of the consortia approach to e-resource subscriptions. Finally, elaborates on the issues and challenges related to library consortia.

OBJECTIVES

After studying this unit, you will be able to explain:

1. What are E-Resources?
2. E-Resources Vs Print resource
3. Various modes of subscription of E-Resources by the Libraries
4. What is Library Consortia?
5. Various models of Library Consortia
6. Benefits of Consortia approach to E-resource Subscriptions
7. Issues and Challenges related to Library Consortia
8. Model License Agreement
9. Major Points of Negotiations with Publishers
10. Some of the Tips for Successful Negotiation (tested and practised).

6.1 INTRODUCTION

Electronic Resource Management (ERM) covers practices and techniques involved in the investigation, selection, acquisition, licensing, access, maintenance, evaluation, retention, and preservation of electronic resources of a library. The growing popularity of the Internet as a source of information resources leads to the need to establish and apply rational collection development criteria to the acquisition of material and information sources available on the Internet. There are several reasons to develop collections of Internet resources for libraries. Internet resources can be very convenient for users since materials are delivered quickly. They are delivered directly to a computer terminal without a patron having to collect materials from around the library building. When such materials can be delivered to a patron's home or office computer, convenience is increased even more and is likely to result in greater user satisfaction. If a library can provide access from the user's desktop, in effect patrons have year-round, 24-hour access to materials.

Libraries are licensing information resources in greater numbers than ever before. During the last couple of decades, the world has witnessed a drastic shift in the way researchers search and collect the information required by them. Given the growing users' preference, migration from print to electronic resources has become a priority for librarians and information professionals. In the current scenario, the number of E-Journals, eBooks, bibliographic/citation databases and full-text aggregated E-Resources are subscribed by most of the libraries which are growing rapidly. Most of these contents are licensed or leased by the libraries. Libraries are facing a lot of challenges to manage E-Resources subscribed by them. Librarians are finding ways to manage and build the E-Resource Collection more efficiently. Due to the increasing prices of E-Resources, publishers and vendor-dominated market, change in demand of the users, availability of various access/pricing models and monopoly of the publishers, it is not possible to fulfil all the demands of the users.

Electronic media or digital content can often provide information much faster than print publications. For example, journals and periodicals can release editions electronically as digital-born contents that are available instantaneously, compared to the days it takes print to arrive by mail. Also, some periodicals release their electronic versions before their printed versions, making them even more timely. For time-critical information, this is of great benefit to the users. As more materials are provided on the Internet, users' expectations increase rapidly, often over what the market or libraries can provide.

When a library, university system, or consortium, acquires a web-based product or digital content and online database, it essentially provides multiple copies since the product can

be widely distributed to a very large customer/user base. If the system components are spread over a large geographical area, this can provide much easier remote access to the materials. Increasing interest in distance education seems to be a trend at many educational institutions, and as a result, the need to supply library materials to distant locations is growing. Providing Internet access to full-text materials for remote users is one solution to this service issue.

The different Library consortia in developed and developing countries have successfully infused a new culture of electronic access to selected scholarly electronic journals and databases in different disciplines amongst the academic community in institutions and universities. The Consortium certainly benefited the higher education system. Providing access to E-Resources to the faculty and researchers is not a purpose in itself. It is only a means to trigger stronger research and academic culture in the institutions/university's recipient of this benefit. The Consortium efforts, therefore, lead to an increase in productivity of scientific research output both quality and quantity. It is presumed that access to E-Resources would invariably make qualitative. The difference in research, learning, scholarly and R&D activities of faculty and researchers. The quality of teaching, research and publications of scientists and scholars are impacted by the accessibility and availability of print and E-Resources. It is presumed that the research productivity of scientists and researchers in beneficiary institutions/universities would increase with the increase in the availability and accessibility of qualitative information resources. Similarly, a high degree of correlation is presumed between the ranks of universities arranged a following number of articles downloaded by them and the number of articles produced by them. Lastly, Return on Investment (RoI) is also likely to be positive and high. Ensuring optimal use of electronic resources is one of the biggest concerns for the consortium that receives central funding from the Government. Libraries and information professionals are required to play a proactive role in promoting the usage of resources amongst faculty and researchers.

6.2 WHAT ARE E-RESOURCES?

An electronic resource is defined as a resource which requires computer access or any electronic product that delivers a collection of data. Currently, libraries are shifting towards new media, namely electronic resources for their collection development so that the demands of users are better fulfilled. E-Resources mainly refer to e-journals, e-books, or all types of databases, e-images, audio-visual content etc. The explosion of information and inadequate library urged the libraries to adopt new philosophies and technologies for collection development and reduce the costs of information. The electronic environment,

as manifested by the World Wide Web, provides an opportunity to improve the measurement of the use of these resources.

In the electronic arena, we can more accurately determine which information is being accessed and used. E-Resources differ from other library materials, because of the following:

- The complexity of the licensing agreements.
- Need to set up access.
- Confusion over pricing models.

These resources are available through,

- Respective publishers, aggregators, vendors, and Library consortia.
- Sometimes on more than one platform.

6.2.1 Types of digital information resources (e-resources)

Following are the common types of digital information/ resources are:

- **Databases:** A database is a collection of information that is organized so that it can be easily accessed, managed, and updated. Databases can contain several types of content: bibliographic, full-text, numeric, and images. This is most commonly done in a table because of its easy-to-read data, and its ability to compare and find data. An online database is a database that is accessed from a network, the most common example of this is on the internet, unlike if it were a local database held on a computer only connected to an internal network or a computer.
- **Continuing education sites and web blogs:** A weblog (blog) is a website that contains a log or diary of information, specific topics or opinions. A blog author (blogger) links to stories or other websites with relevant and interesting information. These links are typically segregated according to the blog's topic or subtopic and written in reverse chronological order, meaning that the most current links display at the top of the blog's home page. Another major characteristic of blogs is the ease of use to post. Blogs opened up online publishing to the masses.
- **Electronic books:** E-book, in a full electronic book, a digital file containing a body of text and images suitable for distributing electronically and displaying on-screen like a printed book.
- **Electronic full-text journals:** An electronic journal is a periodical publication which is published in electronic format, usually on the Internet.

- **Internet sites paid content and open-source content:** A set of related web pages located under a single domain name, typically produced by a single person or organization. Free content or free and open-source information is any kind of functional work, work of art, or other creative content that has no significant legal restriction on people's freedom to: use the content and benefit from using it, study the content and apply what is learned, make and distribute copies of the content, change and improve the content and distribute these derivative works.
- **Reference/Bibliographical Tools/Utilities:** The bibliographic utility is a network consisting of a large union bibliographic database, accessible online to member libraries on a time-sharing basis.
- **Teaching/educational materials:** Educational materials means all curriculum, print and electronic textbooks, instructional materials, lesson plans, teacher guides, workbooks, tests, and other curriculum-related materials licensed, developed or otherwise owned by the school, college, university or any learned society.

In addition to periodicals literature, a rapidly growing body of books and reference materials are becoming available over the Internet. Many standard reference titles that first appeared electronically as CD-ROMs have now been replaced by Internet versions. In the category of commercial reference titles adapted from print editions, most are subscription based. Publishers of subscription-based materials usually offer a free trial for a limited time or make available limited examples on the Internet for customers to examine. Some that are in the public domain are freely available. Another common means of commercial support is for Internet sites to include paid advertisements within the websites to support free access to the users. All the usual types of reference materials are available: dictionaries, thesauri, encyclopedias, directories, guides and handbooks.

Internet electronic materials have the advantage of supporting new information formats and new types of interaction with users. For example, a phone directory may include the ability to see a map of the location found and give driving instructions on how to get there from almost any place in the country. Another example is the ability to look at real-time weather data with maps showing the distribution and movement of clouds, rain, wind, and temperature. Multimedia encyclopedias and handbooks can include images, audio, and video to enhance and accompany the text. Many chemical materials available on the Internet now include the option to view and interactively rotate and examine chemical compound images.

Statistical materials are available on the Internet. Some examples include free, time-delayed stock tickers supported by advertising; agricultural production, trade and

consumption figures from government or international agencies; and historical climate and weather data from government agencies. Access to databases of information may also be a valuable addition to any library collection. Many other types of scientific as well as humanity-based databases are available on the Internet. If we focused on scientific data such as chemical compound and safety information, consumer information, and engineering and agricultural extension data they are freely available. Subscriptions to scientific bibliographic databases delivered via the Internet are the most popular commercial web application. The area of social and human sciences has also a rich collection of online databases for researchers and librarians.

6.3 WHAT IS LIBRARY CONSORTIA?

Consortia is a plural form of the consortium but is often used in a singular form. The consortium is derived from the Latin word ‘consort’ which means partnership. A library consortium is a group of libraries which come together to realize a combined objective that usefully requires cooperation and the sharing of resources. The library consortium mainly deals with resource sharing in digital or electronic format. The consortia aim to achieve what the members of the group cannot achieve individually. According to the Oxford English dictionary consortia means ‘Temporary cooperation of a No. of powers, companies etc. for a common purpose. It is an association of similar types of organizations/institutes which are engaged in providing and servicing the common things for a specific purpose of its users’. A library consortium refers to a group of libraries that partner to coordinate activities, share resources, and combine expertise. The International Coalition of Library Consortia is an informal discussion group of such consortia. Library consortia offer significant advantages to increasingly strapped libraries. This implies libraries coming together in formal agreement to share resources to satisfy their users. Collaborative effort aimed at sharing information resources among libraries with similar objectives so that the collective strength of the cooperating libraries can facilitate improved teaching, learning, research and information service delivery to users. A Library consortium is a strategic alliance among libraries with similar objectives aimed at improving access to information resources in different disciplines.

The exact date of the introduction of the term ‘Library Consortia’ is not clear, but the meaning of consortia as being an association or partnership has long been a principle of librarianship. However, libraries had not used it widely until 1980. Shachaf (2003) worked on that Library Consortia, a new kind of library cooperation, was created as a spontaneous reaction to the journal’s crisis and the new e-Environment. A Library Consortium formation can be local, regional, state, national and inter-institutional levels. Library Consortia's development processes were examined from an ecological approach,

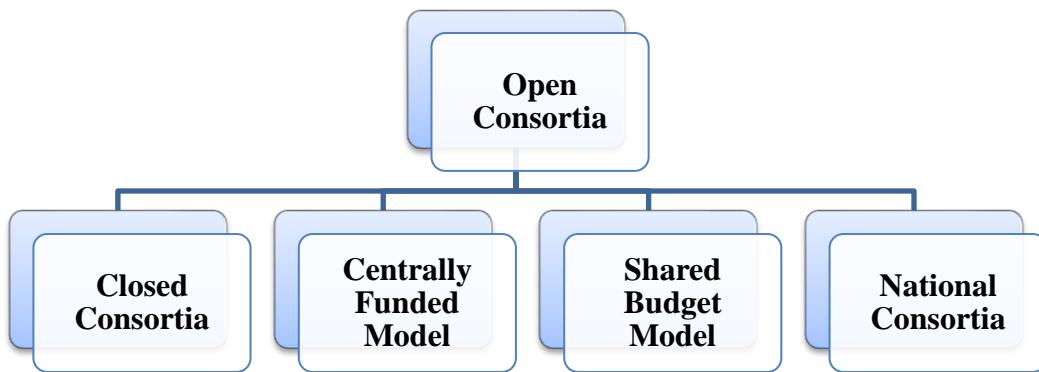
combining historical perspective, dynamic developmental approach and social structure, stressing the issues of permeable boundaries in Library Consortia and the manifestation of inter-organization relationships.

Traditionally library cooperation meant sharing collections in some way but it could also be seen in sharing of services or processes such as joint cataloguing of materials or staff and user training. In general, most libraries kept their autonomy and consortia involvement was a peripheral library service. There are areas in which no library irrespective of its size can be entirely self—sufficient. This problem is solved by forming Library Consortia for information resource sharing. Unlike many other service activities, libraries do not have strong competition among themselves because their target populations are usually divided along organizational or geographical boundaries. An academician conducts his/her research mainly through his/her institution's library and the local community usually uses the local for its information needs. Electronic publishing and telecommunication have enabled Library Consortium to expand both in number and functions over the last decade.

6.3.1 Various Models of Library Consortia

Library Consortium is an Association of a group of libraries to achieve mutually a common objective. It is felt that the concept of E-Journals consortia can work well in the libraries without requiring additional fees to access the E-Journals. The types of consortia identified are generally based on various models evolved in India in a variety of forms depending upon participations' affiliation and funding sources.

- **Open Consortia:** This type of consortia is very flexible, and it is the wish of members of consortia can join and leave any they please.
- **Closed Group Consortia:** It is within a defined group. This kind of consortia emerges either by affiliation or collaboration among them and the formation and operation of the consortia guidelines and its administration are fairly simple and easy.
- **Centrally Funded Model:** In this model, the consortium will solely depend on the parent body.
- **Shared-budget Model:** In this model, the participating libraries take the lead and form the consortium.
- **National Consortium:** The end of this model is, the national-level licensing of products.



Apart from the above there are some other models of consortia also like:

- International Consortia
- Specific Group Consortia
- Subject-based Consortia
- Regional Consortia

6.4 CONSORTIA APPROACH TO E-RESOURCE SUBSCRIPTIONS

In the present era, only collaborative efforts can be sustainable. The cooperative purchasing of e-resources through consortia seems to be surviving hope for the profession, though consortia purchase. A library consortium is a collective activity of a group of libraries towards a common goal of sharing resources. The consortium approach is a win-win situation for all its stakeholders - users, publishers, and libraries - all alike. Users are the ultimate end beneficiaries of such initiatives.

The Consortia offers several advantages to its members including the following:

- A large number of electronic journals can be accessed through the membership of a consortium.
- Access to otherwise un-subscribed materials.
- Hold on to rising costs.
- Availability and monitoring of usage statistics.
- Helpful in developing common resources databases and better scope for developing a union catalogue among participating libraries.
- Effective document delivery systems.
- Enhanced search facilities.
- Better scope for developing a union catalogue among participating libraries, etc.

- Getting deep discounts through joint pricing negotiations with the most favourable terms of agreement for a wider range of e-resources – hence lower unit cost of information
- Help member institutes in making research more convenient.
- Member institutions can get the electronic archives of the journals without any extra cost.
- Researchers and authors get benefits as consortia made it possible to expand greater potential readership.
- Smaller institutions (historically unable to afford many journals) can have access to a wide range of journals.
- The Consortium Acts as a single-window service for a large number of institutions to meet their diverse research and academic interest.
- The Consortium is offered better terms of agreement for use, archival access and preservation of subscribed electronic resources, which would not have been possible for any single institution.

For publishers, the consortium offers reduced attrition; improved income stability; incremental revenue; and greater visibility of their products. In addition, a wealth of relevant resources is freely available on the web for libraries to incorporate into their e-collections and make them readily available to their users to survive the array of challenges and also to have a meaningful presence in the digital era, libraries are rapidly adapting to the changing environments. Recently the concept of library resource sharing has been largely influenced by a variety of nationwide techno-centric consortium approaches in pursuit of optimizing the libraries' resource base while achieving substantial savings through combined and coordinated bargains with publishers. There are several examples of web-based systems supporting resource sharing, collection development and professional enhancement. Applications include union catalogues, cataloguing, cooperative acquisition, inter-library loan, reference and referral services, retrospective conversion and so on.

6.5 SELECTION AND EVALUATION CRITERIA OF ONLINE SUBSCRIPTION DATABASES

Librarians should use the same collection development criteria with Internet information as they traditionally have with print resources. The American Library Association Reference and User Services Association Collection Development and Evaluation Section's (ALA RUSA CODES) Collection Policy Committee has published a checklist of criteria for electronic information. According to this published standard checklist following points should be considered while evaluating and selecting the online content:

- That the scope of Internet materials fits the information needs of the library's clients is paramount.
- It must be of the proper intellectual level, be accurate and presented in an easily accessible manner.
- It should have good intellectual coverage of the subject.
- The materials should be current and updated when necessary.
- Ideally, the electronic location should be stable to allow for easy continued access.
- The materials should be available for the amount of time that they are useful to the clientele.

The following primary and secondary criteria should be used to evaluate all types of electronic resources. Some types of resources have additional features or technical issues that must be considered in addition to those listed below:

6.5.1 Primary Criteria

- I. **Relevance, Content and Scope:** Electronic resources will be selected to support the information needs of the institute/library's primary clientele/user. Primary user/clientele is usually defined as faculty, staff, students, researchers and professionals and visitors who rely on the information services provided by the library. The selection of materials must be based on the primary user/patron's real and perceived needs as assessed by library administration through a variety of methods including committees' opinions, focus groups, surveys, advisory board instructions, and client/user recommendations. The professional librarians will also use their expertise to identify subject areas that need to be strengthened or added. The perceived needs of library users/patrons and the subject focus of the library should be considered first, and the library should include those resources which fall under the scope, mission and vision of the library. The digital contents or resources identified are verified and checked to minimize duplication of resources
- II. **Organization of Material:** the organization of online material accessed through the Internet is an important feature. Using electronic resources should make the tool more efficient than other alternatives. Preference is given to products searchable through a variety of ways, such as keyword, subject, and name searching. In the case of databases, the availability of Boolean operators and specialized commands, such as the expansion or explosion of concepts should be considered. Advanced features that may increase the value of the product are cross-searching and linking capabilities between resources.

The interface should be organized and sensitive for ease of use. The use of a common or similar interface for several tools is an important consideration from a user's perspective. A common interface may also support the advanced search features. Customization of the interface can be an important feature if it allows the creation of individual profiles that meet specific information needs or preferences. Other features to facilitate use and navigation should include menus, clear directions, help screens (contextual screens preferred), and navigational tools. Requirements for plug-ins or specialized materials must be reviewed since this can impact the user's ability to fully utilize the resource.

III. **Quality of Resource:** The quality of an electronic resource title can best be determined by collectively evaluating the following factors:

- a) **Authority:** Evaluate the expertise of authors or editors, reputation of sponsor/producer and the possible impact on content must be verified, reputation and experience of the publisher checked, lack of bias determined, advertising - amount, type, a distraction from content, and usefulness should be checked.
- b) **Content:** Must evaluate the subject and educational relevance, check the accuracy and appropriate level of content, and determine the completeness of resources.
- c) **Currency and Timeliness:** Should be checked to what extent up-to-date information is available, and what is the frequency of updates?
- d) **Special Attributes:** Should be checked the performance and reliability - speed of downloading and general response time, evaluate the search capabilities, examine the tracking capabilities and protection of privacy, availability of statistical reporting to support evaluation of the resource and its use, acceptable formats for full text. Should check or evaluate unique attributes and functions that set it apart from other resources, such as detailed images, superior indexing, special search interface, etc.

6.5.2 Secondary Criteria

- I. **Cost:** The price of an electronic resource is considered concerning the primary criteria, but it is not the sole factor for determining the appropriateness. Costs of services, equipment and support requirements, as well as licensing fees, must be considered in addition to the purchase price of the product. Vendor pricing formulas based on the number of users login at one time within the campus or outside campus must also be considered. The formula should be based on logical criteria that meet the needs of the library. The formula should also be able to accommodate individual and institutional users whenever possible.

Other costs must also be considered when acquiring an electronic resource: such as staff time required to negotiate the contract, set up the resource, and then maintain it, password or account maintenance, additional charges for technical assistance, training costs, and any other indirect costs such as taxes that may be applied to member institutions.

II. Access Capabilities: Web-accessible resources are required to check the access of contents as follows: should be available through a vendor-supplied server whenever possible. If the resource must be mounted on a local server, the costs of equipment, maintenance, and staff time must be considered. Access from narrow bandwidth services must be evaluated to determine performance issues. If the performance is too slow, it may hinder or halt the use of the product by users with limited Internet services. The use of the resource should be platform-independent so that MAC, PC and other types of computers can easily connect to and utilize the program. The standard browsers should be able to interface with the product and those requiring proprietary browsers should not be selected. The version of the browser required may also impact its usefulness to clientele using older software.

The authentication protocol for connecting to the resource must be reviewed. Important questions are raised and answered:

- Does it use an IP address, password, or a combination of factors for authorizing access?
- Are multiple IP addresses or ranges supported?
- Who must maintain the passwords?
- Are connections through proxy servers allowed in the license?

A final consideration is whether the resource will be accessible through institutional firewalls and if the vendor can provide technical assistance or advice for working with this security measure.

III. Systems and Technical Support: Vendor support in terms of technical assistance to library/institute and users must be carefully evaluated. Criteria to be considered are:

- a) Vendor helpfulness, expertise, referrals, and follow-up
- b) The hours that technical assistance is available
- c) Availability of online help
- d) Knowledge and responsiveness of account representatives
- e) Management of passwords/Ids and registration of clients
- f) Availability of direct technical assistance for clients

- g) The number of people who can act as contact points for the vendor
- h) Regular announcements and communications from vendor

Access to resources through a vendor or local library/institute sites must be evaluated in terms of the performance of the system at peak loads; performance of the Internet in retrieving files, printing documents, and speed at peak times; and the need to deploy client software on the local desktop computers. The vendor's license should state their responsibility for ensuring reliable service and their response time if problems do occur.

IV. Simultaneous Users: The number of simultaneous users supported by the system must be sufficient to meet the needs of the primary clientele/patron. Both initial and long-term use must be considered. The actual number of users must be balanced between the cost per user and the adverse effects of having users blocked from the system. The cost per user must be evaluated about the value or importance of the content.

Some Additional considerations must be checked:

- Time outs -- the standard length, ability to change the the period, what user activities prevent a time out, announcements or warnings that are broadcast to users, and what happens when the user returns to the system
- Waivers of limits -- will the vendor allow ADL to exceed the simultaneous user limits or issue special passwords for educational uses, such as hands-on classes?

V. Licensing: Licenses must be carefully reviewed to ensure that the library maintains fair use rights for its clientele/patrons and that the resource is easily accessible to all authorized library/institute users with minimal monitoring or tracking requirements.

The licensing contract should include written clauses on the following:

- authorized users -- clear definition of who is authorized to use the resource
- remote access -- that user may be in dispersed, non-contiguous locations and access is permissible through remote services such as proxy services, dial-in connections, etc.
- user authentication -- through password, IP, or other methods
- fair use rights for library services, including interlibrary loans, document delivery, etc.
- fair use rights for clients accessing the content

- protection of privacy if tracking or monitoring systems are used
- vendor and organizational (library) liabilities
- termination of the contract -- when, why, and how.

VI. Software Requirements: Most resources should be self-contained and require no special client or application software. If additional software is needed, it should be standard application software, such as a Web browser, that is readily available to patrons. Special software required on each patron's desktop must be evaluated in terms of ease of use, installation, and maintenance. Required plug-in applications should be reviewed, as well as specialized software provided by the vendor. Some questions to be considered are:

- How automatic or easy is the installation of the software?
- Will the patron be able to install it or will it require assistance from technical staff?
- How will upgrades of software and plug-ins be handled in the future and how often will they be needed?

A final consideration is whether the software behind the resource can be modified to brand the site. Branding the site may include adding the organization's name to the home page; adding special links to other Web pages or for e-mail; or setting preferences in how the product is presented to the user such as advanced or beginner modes.

VII. Training And Educational Support: Handouts, manuals and other instructional information should be reviewed. It should be determined if additional materials will need to be created or if special education programs will be required for staff and patrons. The availability of online tutorials or help screens should be determined. An estimate of the amount of time to learn and teach the system should be made. The need to publicize the resources should also be discussed and any marketing and promotional concerns identified. Another consideration is the method used by the vendor for sending out information to the library/institute and clients about new features and changes to the resource.

6.6 E-RESOURCE PRICING MODELS

In the absence of a standard pricing model, consortia have to negotiate with the publishers or the vendors to arrive at mutually agreed prices and the terms and conditions of accessing their sources. So far as evaluation of the package is concerned, trial and demonstration would be necessary to take the opinion of the users about the usefulness of the product.

Different publishers are offering different pricing models to the consortia. The subscription rates depend upon various factors like:

- number of users,
- availing of inter-library loan,
- duration of subscription,
- level of use,
- on a standalone system,
- on Local Area Network, with IP address or on Proxy Server etc.

Pricing of E-Resources- Different Models

- Print + e-journals, only e-journals
- List price, List price & discount
- Select title, Subject bundle, and Entire package
- Core collection+ subject collection+ content /access fee
- Membership based pricing
- Tier-based pricing- number of users & level (FTE), number of concurrent users
- Flat fee, cross-sharing, core collection & custom collection
- Usage-based model

Single-Year, Multi-Year, Pro-Rata Pricing

- Single location, satellite locations, multi-location
- Consortium prices- depend on numbers
- Subscription model, with perpetual access, entire back files, select year files
- Pay per article or collection of articles (number of downloads).

6.6.1 Bundle Pricing of e-Resources

Bundle pricing has its problems in which many titles are aggregated into a single product based upon subject areas which then is marketed and sold as an all-or-none at all. To avail bundle pricing of e-journals, libraries have to cancel other individual titles which may be more useful. It is not affordable to avail of both pricing models for most of the libraries. The bundle pricing may suit only those institutions which have more diverse needs and may not be suitable for specialized institutions. However, evaluation of these resources in the terms of usability is difficult. Publishers are interested to offer a bundle price for all their publications. It is not easy to make the exact assessment of the usage of the package and take the right decision whether to go for bundle pricing or purchase elective titles by paying more for the individual title. No doubt, that this pricing model gives access to a wide range of collections, but the usability of all the resources contained therein cannot be ensured in advance. The suitability of the pricing model has become important for the

acquisition of e-resources. The benefit of bundling is that the bundled package is generally priced significantly lower than the sum of the individual items bundled.

6.7 LIBRARY CONSORTIA: ISSUES AND CHALLENGES

The library consortium activity is a complex process, which involves the wholehearted support and concerted efforts of the member libraries, their management and the publishers. There are several issues relating to consortia. Some of the major issues and challenges across consortia are as follows:

6.7.1 Identification of E-resources: With a limited budget allocated by the funding agency, one of the greatest issues involved is to meet the expectations of the participating members. Identifying the most suitable e-resource which is agreed upon by all the members of the consortium is more or less a difficult proposition. This is mostly because every member has their requirement of e-resources, though the overlap between the e-resources will be on the higher side in the case of an ideal homogeneous group. Sometimes, it is difficult for the consortia to arrive at a consensus over the e-resources to be subscribed to. The needs of the members can be fulfilled only if the consortia had a sufficient budget. In the case of a budget crunch, this issue becomes the prominent one.

6.7.2 Pricing of E-resources: The greatest enigma of e-resources is pricing which is not fixed as in the case of printed material. No standard practices or processes are being followed by the majority of the publishers and hence this is a grey area altogether. In most cases the cost of the journals is out of reach of many of our libraries and only a consortia approach could provide some meaningful practical solution. Publishers are invited for negotiations and asked to offer their best prices to the consortia. Several methods of pricing are followed, but what is important is that finally the price offered by the publisher should be economically viable for the participating libraries and should also ensure uninterrupted and perpetual access to the resources. There might be an increase in price due to inflation. Sometimes the merging and splitting of publishers often result in the postponement of implementation of the negotiated agreements between the consortium members and the original publishers' offer. The base price quoted for the calculation of the consortium deal often is worked out for the developed countries and publishers are quoting the same price structure for the Indian consortium. Different publishers have different pricing policies and models which go on changing from time to time. It is difficult to remain in touch with these changing policies and models which may further vary from publisher to publisher also.

6.7.3 Negotiations: The Library consortia have to negotiate the subscription rates as subscription rates/outright purchases are not fixed. The terms and conditions of the license of different publishers are also different. Publishers want to protect their interests which

may not suit the libraries. Therefore, terms and conditions also shall have to be negotiated. Negotiations for subscription to e-resources, terms and conditions on purchases and legalities involved are done by negotiation committees consisting of experts in their respective subject fields and members of the committee is not acquainted with the art of negotiation. These Committees do not have professional negotiators. Moreover, most often, committees negotiate rates of annual subscription offered by the publisher and annual increases in rates of subscription. Other terms and conditions of subscription are not even discussed. Most of the consortia sign agreements prepared by the publishers without getting the terms and conditions vetted legally.

6.7.4 Print-dependent Subscription: Some of the publishers like Elsevier's Science Direct, Taylor and Francis are still quoting the print-dependent subscription rates which creates problems for the consortia as well as for the libraries to justify the rate of subscription.

6.7.5 Taxation Issues: Libraries will have to deduct tax at source (TDS) when they make payment for the purchase of e-books/e-journals as they may be considered as software/electronic data. Publishers, particularly the foreign ones, are resisting the deduction, as it will be both a financial and operational nuisance for them.

6.7.6 Archival Issues: Online resources are remotely located which often remain under the ownership of the publishers or vendors. The publishers offer access to subscribed e-resources for the period of subscription. Access to e-resources gets terminated as soon as the subscription period is over and consortia decide to terminate the subscription to a given e-resource. However, most publishers offer access to e-journal archives for the period for which the subscription was paid for free or for a fee. Publishers, most often demand a fee for using their access platform for accessing archives after the termination of the subscription. Archiving back files is also a problem. If the responsibility of archiving is assigned to the publisher, consortia shall have to pay maintenance and license charges for back issues. The decision has to be taken whether archival responsibility would remain with the publishers or consortia will make its arrangement. This is an area which needs utmost attention and unfortunately, this is yet to be attended to by the consortia in India. Long-term preservation of the invaluable wealth of information being accumulated by the consortium is to be archived and preserved for posterity. As the technology is fast progressing and also getting obsolete almost at the same pace, it is high time that these costly information resources are carefully archived and preserved on a long-term basis.

6.7.7 Continuity/Perpetuity: The consortium needs to subscribe to e-resources in perpetuity since journals and databases are published in perpetuity. It is difficult for most

of the Consortia to convince their concerned ministry about the continuation of an initiative indefinitely. As such, a continuation of a Consortium in perpetuity becomes questionable.

6.7.8 Access Management: There are various access methods offered by publishers for accessing their resources and it varies from case to case. Access authentication could be User ID/Password based or IP based which are popular among them. Access is also gained through the proxy servers at the member libraries by registering only the proxy server IP address with the information providers. Proxy server and setting up of VPN is being used by some of the consortia, whereas some consortia are using EZproxy as a temporary solution to provide off-campus access to fulfil the ever-increasing demands of the users for remote access to subscribed content. Proxy server and setting up of VPN can at best be considered as a temporary solution with several inherent problems.

6.7.9 Usage and usability Issues: The Return on Investment (ROI) of the consortium is measured in terms of the increased usage, and usability of the e-resources which is ultimately reflected in the scientific productivity of the member institutes. The usage of e-resources is one of the most important parameters to judge the effectiveness of a consortium as well as an e-resource. It should be the earnest efforts of the consortium, the management, the researchers and faculty and the librarians which determine the success or otherwise of any consortium. Manual compilation and analysis of usage statistics is a time-consuming process for a consortium having a large number of member institutions. The consortium should harvest the usage statistics from the publisher's website directly to remove the human intervention of data manipulation.

6.8 NEGOTIATIONS WITH VENDOR

Some of the tested and practiced tips for successful negotiation:

A) Before negotiations

- Be prepared with all the information required
- Know which resources you need
- Know your budget & price you can afford/are willing to pay
- Be clear about what is a sustainable price
- Who represents Library, publisher & consortium?
- Plan what to gain, be open & but be flexible
- Try to understand the publisher, market standing, and values they stand for
- Have trial access & use data
- Get initial price quote- review, check with other libraries
- Get a draft copy of the license & thoroughly review & identify issues.

B) During negotiations

- Listen carefully & actively & be alert
- Ask proactive questions, communicate clearly
- Never assume anything- seek clarity
- Be assertive-but, not aggressive
- Take notes, check them frequently, and use them often, do not miss out on important points
- Clear up any misunderstandings promptly then & there only
- Know when to take a break- if not leading anywhere
- Know when to walk away- when not in agreement

C) Some more tips

- Negotiation is not an “I win-you lose”, should be a “win-win”
- Avoid oral agreements
- Know what you can give up & how much you can spend
- Plan your negotiations- timing, duration, people involved, moves
- Stay focused & on track with your needs
- Need not be in a hurry to complete the process

6.9 CONCLUSION

Electronic media or digital contents are an important source of information. Presently we are living in a digital-born society. We all know that digital and electronic material can often provide information much faster than print publications. When a library, university system, or consortium, acquires a web-based product or digital content and online database, it essentially provides multiple copies since the product can be widely distributed to a very large customer/user base. The librarian should justify the inclusion of Digital Contents in the collection with criteria as rigorous as for print materials. The same standards of accuracy, authority, coverage, currency and objectivity need to be applied to Electronic Resources (Online Databases) as to any other medium. Before subscribing to an Internet information provider, thoroughly investigate their products, consult with peer libraries for evidence of satisfaction, and test the products under local conditions to determine potential problems. Carefully plan the implementation of new products, making sure institutional resources are sufficient to support them. Make sure that adequate user assistance is in place at the time of public implementation. After subscribing to Internet vendors maintain a dialogue with them, giving them both positive and negative feedback on service issues. Cost does not matter, but accuracy, bias, currency, design, structure, stability, interface, publisher reputation, sponsoring agency impact and licensing to use are important factors that must be considered while subscribing to the online databases

With decreasing library budget, the judicious use of money to satisfy the need of maximum users is the need for the time. With the availability of ICT and internet technology, library consortia are one of the ways to tackle this problem. It benefits the libraries to procure more electronic resources

in the library with a limited budget and increasing demands of the library users. Collective and logical negotiation with the publishers to get the maximum resources at the minimum price is a way by which librarians can optimise the use of resources. There are various issues involved with consortia, but these issues can be tackled by adopting the right approach and following the right procedures with the coordinated approach of the members of the consortia.

In a developing country like Pakistan, a major portion of education and research are funded by the Government, national consortium is the practical solution, making one payment and adjustments while allocating their budgets may be a worthwhile solution. It may be a cost-effective mechanism if worked out at the government level. It would be highly appropriate if different consortia come together so that they are benefitted from more members of the consortium in the larger national interest. A national consortium would greatly reduce duplication of efforts and provide greater purchasing/negotiation power.

Several e-resources are common among all consortia. All the consortia have limitations in terms of provisions for digital archives, provision for federated search and discovery services, off-campus access to resources for authorized users, compilation and journal-level usage analysis, harvesting of usage data and trend analysis, etc. Although these limitations are crucial for any consortium, their solutions for a single organization or a group of organizations, are too expensive as well as technology and infrastructure intensive. Most of the consortia operate as projects given to one of the beneficiary institutions using non-plan funds and do not have the adequate financial and technological support to overcome these limitations. As such, there is a requirement for a single umbrella organization that looks after all the consortium initiatives as well as address the limitations that are common to all the consortia.

6.10 SELF-ASSESSMENT QUESTIONS

1. Define E-resources and discuss various types of digital information resources.
2. What is library consortia? Elaborates on various models of library consortia.
3. Discuss the various consortia approaches to E-resource subscriptions.
4. Explain the selection and evaluation criteria of online subscription databases.
5. What are E-resource pricing models? Discuss.
6. Elaborates on issues and challenges faced by library consortia.

ACTIVITY:

1. Prepare a draft university library consortia model of shared collection development.

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Unit-7

QR CODE AND USEFUL APPLICATIONS IN LIBRARIES

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INTRODUCTION

The unit is organized to discuss and introduce different technological aspects of the Quick Response (QR) code. It will also describe what is QR codes Structure, benefits, types, and purposes of QR code. Moreover, instead of the current systems with the issues presented in the literature, this unit describes the application of QR codes in libraries and its implementation process.

OBJECTIVES

After studying this unit, you will be able to explain:

1. What is QR Code?
2. What is the structure of the QR Code?
3. What are the basic features, benefits, and types of QR codes?
4. How do libraries use QR Codes in providing various library services to users?
5. What is the key to success in the implementation of QR codes in libraries?

7.1 INTRODUCTION

As expansion of new technology trends, it widens to library platforms that generate an opportunity to leverage the way people access the right information more quickly anywhere anytime. As Dr S R Ranganthan said in the fourth law of library science “Save the time of the reader”. So, to fulfil this law, library professionals need to go through some advancements in technology to improve the services of the library, the quality and the way to provide it is so indispensable to adopt new applications. The library is required to keep up with the digital world using various technologies that are available in this modern age. The library in a print form with physical space will not survive in the digital environment. In the current academic environment, library services should be directed toward changing users’ information needs. Two decades ago, is the period when an academic library could function solely as a quiet place to study and a large repository of physical items like books, journals, reports etc. to be collected, issues, return and examined is not workable with methods of pedagogy and research in the current situation. Rather than solely providing a location for print to be housed and the reference services to physically locate items, libraries in the digital environment must facilitate access to content through technology.

There is a range of new methods and tools that can be used in changing information and communication technology circumstances and these potentialities need to be aware by librarians. Knowing new technology with different tools and digital content creation finally, facilitating the academic community is a big challenge. By doing so academic libraries can establish themselves in the pedagogical community of the current environment. With these new challenges come new opportunities. Librarians can do far more to enhance library services and integrate all activities to support academic performance. One of the opportunities now a day is QR Code based services.

Over the past two decades, library management systems have been increasingly used by libraries to store data digitally and make library processes more efficient. The primary issue for any library system is organization and record keeping due to its large number of users and items. Misplaced items are especially an issue due to the frequent movement of books within and outside of the library, creating a struggle for the librarian and the user to find books. The second focus of a library management system should be the user. Since a library’s function is primarily to enhance education and gain knowledge, it should be geared towards public accessibility and ease of use. In the end, the user should be more directly involved with the information and become independent users in a library. Although using different technologies such as RFID, Barcode, and IoT (Internet of Technology), the application of technology in library management is usually not satisfactory. This is either because these systems are time-consuming and highly human-dependent or because they are unfeasible for most libraries due to a lack of available resources. Already various techniques applied in to strengthen the serviceability of library activity, QR Code

is one of them, through it can fulfil the essence of users and the professionals of library science also it is a big challenge to implement and integrate all the activities to support academic function.

We all know that mobile is one of the powerful devices that people use in day-to-day life. Mobile devices are mainly used for voice communication. Along with the voice communication facility, these devices also offer different types of services to their patrons. Nowdays there is a huge variety of mobile phones with different features at a very low price. They have cameras and support the Android or Windows operating systems. With the advent of ICT, the concept of the library has changed. Libraries are procuring E-journals, Magazines, CDs, DVDs, etc. Now libraries are providing online services, references services and RFID-based circulation systems. In the recent past, European countries have used QR codes for their existing library system. The QR coder is the technology that can deliver to the user the information in a code. Quick Response Codes (QR Codes) are two-dimensional images that, when scanned by a smartphone's camera, prompt the smartphone to open a webpage or display an image, video, or text. Today QR codes are in the early stage and will take some time to grasp the world to shift as a whole to the digital world. As the internet has become a part of everybody's life in the same way QR codes will also become a necessity to access any particular information. The libraries should take a step to implement its various areas and encourage their users to go through that as they are implemented to make users' lives easier. It offers new ways for communicating and exchanging information and knowledge, with the help of ICT tools are affecting revolutionary steps to changing the way information is stored, retrieved and dissemination for automating their activities, creating a dynamic website with useful features context, easily accessible links etc. They are striving hard to cater for the information needs of their patrons by providing a point need assistance with just-in-time virtual and physical spaces. In this connection, QR code is a new technology which helps libraries affordably connect its patron by being context-sensitive without visually assaulting them. This technology has the potential to connect patrons to information about its materials and services.

By now, most of us are aware of QR codes, two-dimensional codes that can be read by a QR reader on a camera-equipped mobile device (Cellphone, tablet or iPod touch). These codes are useful due to their ability to represent the alpha *and* numeric data. Similar to bar codes, which represent a series of numbers, QR codes represent text that is then used by the mobile device for acting. Codes can be created to link directly to a URL, create a vCard (saved to the mobile device) or initiate a phone call, text or e-mail, among other functions. Because QR codes can represent so much data (up to 7089 characters) the potential uses are varied.

QR codes, used mostly to provide a link to content on the Internet, are increasingly seen in many locations, such as toothpaste tubes, advertisements or UPS packages, and formats including print, video, and magazines. Though the most common use of the codes is for Internet linking, the codes are also used for simply saving information (for example, phone number, address, call number)

to a mobile device. Regardless of the function of the code, the text is decoded by the device, at which point the user decides how to use that text (open a link or save). Mobile devices need not be connected to the Internet to save textual information, but an Internet connection is required to follow a link to connect to web-based content.

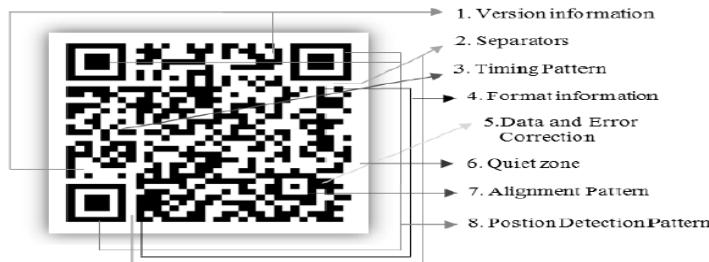
7.2 WHAT ARE QR CODES?

QR (for “quick response”) codes are a type of two-dimensional barcode or data matrix. Modern smartphone and tablet users can interact with these barcodes by scanning them with their device’s camera. QR codes can be used to store URLs, text, or numbers. They allow “tagging” of items in the physical world with additional data or links to online material; a QR code “links the physical world (e.g., poster, printout, room, physical object) to the electronic (web resource) and facilitates communication (SMS message, phone call), adding significant value by improving access to information.” For instance, a QR code printed on a poster advertising an upcoming event would allow users to scan the code and save the data about the event to their phone. A museum display tagged with a QR code could link users to an online audio file describing the exhibit in detail. A QR code mounted near a print copy of a journal could be used to link users to the online version of the journal. QR codes can also be used to quickly exchange contact information such as e-mail addresses and telephone numbers.

QR codes were originally developed by the Japanese corporation Denso Wave in 1994. They were designed for use in inventory management, where speed and error correction are major concerns. Denso Wave freely shared the idea for the codes with others, and over the next decade, several standards organizations developed their guidelines for implementing QR codes. The current ISO standard for QR codes, finalized in 2004, can be found in ISO=IEC18004.2 QR codes have several distinct advantages over traditional barcodes. They can store far more information, they can be scanned at high speeds in any direction and orientation, and they have built-in error correction features that allow them to be read even when partially obscured. Traditional barcodes can store up to 20 digits, but QR codes can store up to 7089 digits or 4296 alphanumeric characters. They can also be used to automate small tasks such as dialling a phone number or sending a text message; scanning the QR code with the number and type of message embedded in it prompts the user’s device to start a call or text to that number. While they are currently very popular in Japan, the United States and all around the world both in developed and developing countries too. Major retailers, industry and business enterprises are using QR codes in their print advertising and on in-store signage. Users can scan the codes to get additional information about the product or special offers.

7.3 STRUCTURE OF QR CODE

QR Code consists of 3 squares out of 4 corners of the symbol and zones. The positioning pattern of the QR Code verifies that it is QR Code and is confirmed by different located segments.



- 1. Separators:** which separate the position pattern of the cells from the rest of the data.
- 2. Timing patterns:** These are placed between two positioned patterns alternatively which makes down the timing of incoming code. his pattern is used for the central correspondent of each cell having black and white patterns respectively.
- 3. Alignment pattern:** The alignment pattern of the QR Code is used while capturing the code using a camera for correcting the deception caused while taking pictures. The central correspondent part is identifying to correct the distortion of the symbol.
- 4. The data zone:** The data zone of the QR Code is the area where encoded data is stored, converted into 0's and 1's and finally transformed into a white and black cell.
- 5. The Quiet zone:** It is a margin of at least 4 bits around the code. This region is free for all the symbolization. Also keep separate the QR code symbol for the external area.
- 6. Version Information:** The versions of the QR Code reformate information helps in error correction and data restoration, while the code is distorted. It is located next to separate while decoding it is read fast by the scanners.

7.4 FEATURES AND BENEFITS OF QR CODE

7.4.1 High-capacity encoding data: QR code is capable of handling several dozen to several hundred times more information compared to conventional barcodes which are capable of storing approximately 20 digits.

7.4.2 Small printout size: QR code carries information both horizontally and vertically. Hence QR code can hold the same amount of data contained in a barcode in only one-tenth the space of it.

7.4.3 Damage resistant: QR code has error correction capability. Data can be restored even if the symbol is partially damaged. A maximum of 30% of the code word can be restored.

7.4.4 Readable can any direction in 360 degrees: QR code is Omni directional i.e., capable of 360 degrees, high-speed reading it accomplishes this task through position detection patterns located at the 3 corners of the symbol, This position detection pattern guarantees stable high-speed reading.

7.4.5 Structured app end feature: A QR code can be divided into multiple data areas. One data symbol can be divided into sixteen symbols allowing printing in a narrow area.

7.4.6 Benefits of QR Code

- It's fast
- Store huge amount of data
- Use anywhere
- No specific skill is required
- No additional technology is required
- Use the Information later
- Anyone can generate it
- Increased customer satisfaction

7.5 TYPES OF QR CODE

Following are five different types of QR Code:

1. **QR Code Model one and Model two** are the typical types of QR codes which are considered the main structure of QR codes for other types.
2. **Micro QR Code** is a type of QR code which has the main feature of one position detection pattern, and it has a reduced size of printing.
3. **IQR Code** is a QR code which is present in both square and rectangular shapes so that it can easily be printed on cylindrical products too. It stores more data in less space than compared to the regular one.
4. **SQRC** is full formed as Secure Quick Response Code hence it provides security to encoded data by providing reading restrictions to it.

5. **Frame QR** codes are QR code which has a canvas area for providing different shapes to QR code and making them more attractive to users and customers.

7.6 PURPOSES AND VALUE OF QR CODES:

QR Codes are gaining popularity because the technology is "open source", i.e., available for everyone. More advantages of QR Codes over conventional barcodes are larger data capacity and high fault tolerance. QR codes are easy to generate and use. They are a convenient way to store all kinds of data in a small space. If the data you want to store in a QR code is made of only alphanumeric characters, a single QR code can hold up to 4000 characters. As they can store different types of information, QR codes are used for many purposes. QR codes are commonly used for holding data such as:

- **Simple text:** welcome messages at conferences.
- **Addresses:** personal home address, business address.
- **Phone numbers:** personal telephone number, your college phone number.
- **E-mail addresses:** personal or academic accounts.
- **URLs:** addresses of websites or specific web pages.
- **Links to Apps:** found in app stores such as Google Play or Apple's App Store.
- **Payments:** QR codes can store information about your bank account or credit card
- **WiFi authentication:** QR codes can be used to store WiFi networks authentication details such as password and encryption type, when you scan such a QR code using your smartphone, it can automatically join that network.
- **Other uses:** such as for transcripts and degrees.

7.7 THE APPLICATION OF QR CODE IN LIBRARIES

Although QR codes are a relatively new technology, many libraries are already using them for promotion and instruction. They are free and easy to use as well as embed many types of media. Once you write a code you can also change the appearance to include a picture or logo within the QR code. The usage of library sites is increased as the user doesn't need to type long URLs. The use of quick response (QR) codes in libraries are just beginning to evolve, with varied and vast features. They have been effectively used in the library to deliver information appropriate to the context and location of the user. Library exhibits that include a QR code link to songs, videos, Web sites, surveys, contests, etc. Codes in the library stacks/end caps or magazine/journal areas that point to online electronic holdings of print materials or related subject guides.

There are several applications to use QR codes in library and information science. It is one such technology which caters to the user requirements of providing access to resources through mobile phones and other portable devices. In recent times many educational institutions are willing to apply this technology, and some had already been used. QR Code is an advantageous technology which converts our needs of information from physical to virtual mode within a second. It is a very comfortable way to go through a variety of information like websites, Emails, Social blogs, phone numbers, SMS, Maps, and calendar information in any direction. It can effectively provide appropriate context and location to the users.

Here we are highlighting some features of QR Code which are beneficial for time being the library services.

- **Library Websites:** Nowadays it is very difficult to remember having different URLs for different purposes. So, one has to create and scan a QR Code that will automatically access our mobile, and then even if it changed later on the URL of the library website, it is automatically reads to the new one without changing of QR Code.
- **Multi URLs:** This can be used for URLs of different purposes very prominently that link to the main websites and access more advanced information.
- **Library Contact:** Applying this QR Code technology one can easily go through the direct contact of any library where they get an email, phone no, address and website.
- **Full-text databases:** It can be possible by using QR Code, just to scan it and accordingly what you need, you receive it without any hindrance.
- **Scan& download article file:** If one can find or want any particular article, request the librarian to send only one QR Code, and you will receive a full-text article on your mobile.
- **Bibliographic databases:** According to the availability of resources if any users ask for databases handily, they can just scan QR Code and undoubtedly get a direct link to databases. It will easily come to your mobile.
- **E-books:** In addition to physically books if any user can access them on their mobile phone using QR Code. It will display on your devices which are subscribed by your respective education institution, just to scan it, read and download it.
- **News clipping Services:** According to need users can scan QR codes and the moment can scan users receive information accordingly without any barriers.
- **E- Text book:** If any users want to browse s available textbooks, just go through the particular hyperlink, whatever they choose interest it just scans the code read & download it.

- **E-Thesis: /E-dissertations:** QR Code can access additional links for thesis and dissertations according to their user needs.
- **Old Question Paper & study material:** The list of Question papers and study material on the user's mobile phone, will display on mobile devices.
- **Library handbook:** One can automatically download the pdf file, which can access from home also by using QR Code.
- **Library Catalog:** By linking QR Code to the catalogue records users can easily get the information regarding the particular item including call number, location etc.
- **Scan to mail:** With QR code it is very easy to send mail to a librarian without typing any e- mail address in any service provider, just simply put on to composed and send it & to avoid the tedious task.
- **Event QR Code:** It helps in promoting an event which will automatically press on to the leaflet, broachers of library event. It will come to mobile very enticingly without spending any money.
- **FB Pages:** There is no need to instruct the users to go different steps to and access the Facebook page. So simply scan with QR Code takes to institutional pages directly and log in easily.
- **Twitter:** If any user scans QR Code through twitter, that code automatically concedes to find someone and follow each other.
- **Social Blog:** social blog allows users to leverage the key information followed by someone's blog and customize the profile users also.
- **Library Tour:** Libraries have different kinds of videos may it a library tour, orientation or may be related to an institution.
- **SMS Reference:** Ask a librarian is an SMS service offering mobile patrons the ability to text their questions to the librarian in real-time manners.
- **Mobile number:** It is a better way that the librarian can create a QR Code with mobile no. So, whoever wants to talk can scan it and automatically receive the particular mobile no.
- **Web OPAC:** many times, to find these links in there if you provide a particular QR Code for opening OPAC of the library.
- **Video Library:** If any institution can create a video by themselves, also make a YouTube playlist video and a code embedded with QR Code technology then any individuals can access it accordingly to their purposes and save it for later also.
- **Book Contents:** The content of a particular book is visible on mobile is one of the innovative features. Other bibliographic standards like MARC 21, and CCF only display the particular title or author information, may not the contents so that it is the overcome the problem.

- **Author's profile:** If a book is written by 3/4/5 authors then it is very difficult to write a profile of an author in a small place, but it is an easy to add comprehensive information links to brief bio-data, authors profile etc. through mobile code.
- **Book Poll:** The title of the book followed the button of each title where there is a QR code is mentioned. So, in these manners, the libraries can easily find out for a book for the reader.
- **Call out:** If any user needs a particular paragraph, theme, pictures, table from such library exhibitions, encyclopedia, other resources or that type of theme of information there is no need to open the particular website, by the scan with QR Code it can easily acquire it read & download it and store for future purposes.
- **Library Guides:** If embedded the QR Code with library guides users have benefited in a great way, real-time also read. It is also reducing the inconvenience of users and earns it in a fraction of a second.
- **Library Exhibition:** Users can receive updated information regarding library exhibitions their features, planning, and designs users can find quickly by QR Code.
- **Building update:** If any user is interested to know the updating information regarding building construction users can easily get it if their respected library has created a QR code.
- **Study Room Reservation:** The QR Code is pasted on the doors of study room areas, where connecting to reserve it very easily and get it after scanning it.
- **Library collection:** Many times, the library has huge collections in the form of new arrival books, and videos. So, to promote library materials, the new arrival item QR Code helps prominently to users.
- **Journal Website Link:** If any users are willing to read any particular article & don't have much time to visit the library and read physically then they scan the mobile code & undoubtedly get the pdf within a second.
- **Print Journal/ article:** With the benefit of QR Code one can receive the article as per their interest by put on a simple mobile code.
- **Shelf Ends:** If anyone can insert a QR Code, goes to the Racks and can grab the book easily.
- **i-help:** Form this any users can get any online help regarding their needs & purposes.

In addition to using QR codes for promotion and instruction, libraries are beginning to see QR codes appear in their material other uses for QR codes include automating the connection process for Wi-Fi networks. Libraries with Wi-Fi can post a code containing the details of their network for users to scan. This simplifies the connection process and doesn't require the user to input lengthy network names and passwords. It also ensures that any electronic resources based on IP authentication would recognize the user as coming from the library's network and not their data network.

7.8 QR CODE IMPLEMENTATION IN LIBRARIES: SOME SUCCESS POINTS

Disseminating information and engaging with a generation of mobile, social and always-connected students, QR codes have tremendous potential. Using this technology provides an opportunity to not only facilitate library tasks but also to strengthen connections with this generation.

When developing and implementing QR codes in the library, consider the following keys to success in the development of QR code projects.

- Use the codes only when the implementation will add value to the experience of the user. Using QR codes for the sake of technology is seldom a good reason.
- Modify the codes with colours or images to be customized to your institution.
- Provide as much education as you can about QR codes, including how to use them and how to install a reader. Simply using the codes effectively is a great marketing tool.
- Start with temporary signs and move to more permanent signs as the implementation becomes more permanent.
- Experiment and be creative with different uses to find those that work better. This requires that users of the codes be tracked.
- Codes are cheap and easy to produce. Adapt existing codes to how they are used.
- Just because one implementation is not used does not mean that QR codes are not worthwhile or effective. Try another project until you find implementations that work well in your environment.
- Have fun with the codes and broaden the possibilities of how to use the codes to help students engage with the library and the content provided.

7.9 CONCLUSION

As the use of QR Code are increasing day by day. It has covered various fields like marketing, business purpose, travelling, and library also one of them. So, we can say in words that it is the reflection of growing technology and its impact on our academic user community. In the coming days, users faced more experiences by using this wonderful tool. QR codes also help in social distancing. Using QR codes the payments can be done at the doorstep and contact will not take place. In return, the people can follow the precautions on social distancing set by the governments. It is a user-friendly process for the customers

and the delivery agents. This payment process where opening and scanning the QR code can overall contribute customer experience.

Libraries are now being very challenged by the development of various technologies. In the present technology-rich age, library users are becoming tech-savvy. They are continually looking for finding ways to use technology to simplify their information-gathering methods. Hence libraries are needed to be flexible in changing and adapting new technologies in their activities and services to create value-added services. Libraries value their relevance as the gateway to information. QR code technology is easy to implement, free to use and growing in popularity. Incorporating them into library services publicity and marketing campaigns, or around the library building or on the website offers users a more interactive learning experience.

The user would have easy access to the most current and necessary information related to the library by using a QR code. So, to make effective use of QR codes among the user community, library professionals must organize user awareness programs, orientation programs, etc. QR codes are a quick and easy way to link library patrons to information and services on their mobile phones. These codes are simple and inexpensive to create and can be used to provide fast access to online materials, multimedia, and short blocks of text. They can also be used to automate tasks like making a call, sending a text message, or connecting to a WiFi network. Although QR codes are relatively new technology and their future is uncertain, readers should become familiar with what they are and the variety of ways they can be used to provide mobile services to patrons.

7.10 Self-assessment Questions

1. What is QR Code? Explain its structure, purposes and benefits.
2. Explain the various types of QR codes.
3. How can libraries use QR Codes in providing various services?
4. Describe the successful full implementation plan of QR codes in libraries.

ACTIVITY:

1. Prepare a draft plan of QR Code-based library services in a university library.

RECOMMENDED READING:

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Unit-8

WEB 2.0 AND WEB 3.0 AND THEIR APPLICATION IN LIBRARY SERVICES

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INTRODUCTION

The unit focus on web 1.0, web 2.0 and web 3.0 technologies. Elaborates on the difference between these technologies and salient features of these emerging web tools. It will also discuss the application of web 2.0 and web 3.0 in libraries. At the end of the unit, we will learn about the emerging concept of library 2.0 and librarian 2.0.

OBJECTIVES

After studying this unit, you will be able to explain:

1. What is web 2.0, and web 3.0?
2. What difference between web 2.0, web 3.0 and beyond?
3. What are the salient features and characteristics of web 2.0 and web 3.0?
4. Application of web 2.0 and web 3.0 and beyond in libraries.
5. Concept of library 2.0 and librarian 2.0.

8.1 INTRODUCTION

Internet and web technologies have come a long way. Both Internet and web technologies are different terms but are very much interrelated to each other. Internet is a huge network of millions of computers interconnected to each other globally and forms a network where each computer can communicate with another computer; whereas the World Wide Web is a medium through which users can access information over the internet through browsers where information is displayed in Webpages which are connected in hyperlinks, contains texts, graphics, audio, videos etc. With the advent of time, there have been rapid changes and development of web technologies. The Internet has played a vital role in the development of every aspect of our life. The Internet has at once a worldwide broadcasting capability and is serving as the most common medium of communication between individuals and computers. The internet was invented by Tim Berners-Lee in the year 1989. The main idea behind its creation was to allow users to share information among themselves. In 1991 a new technology was introduced which changed the internet. It revolutionized the transfer of information from one place to another without any geographical limitations. This technology is known as the World Wide Web or WWW. It was created as an interface for the Internet. Since the invention of WWW, every field got enormous strength. It is the fastest-growing medium of communication. It directs all the disciplines towards new and advanced technologies. These technologies are used to provide new development in every discipline.

The World Wide Web, (WWW) got developed in three phases. The 1st phase is known as web 1.0. This generation of web only had single-way communication between user and website. Since 2003, the 2nd phase is termed web 2.0. The user has the facility to provide his feedback in this generation of web. Now the 3rd phase of the web i.e., web 3.0 is emerging. This generation of web i.e., web 3.0 is also termed semantic web or intelligent web. Users are now allowed to read, write and execute web. It offers an integrated web experience. It enables the machine to understand and catalogue the data a humanly. It facilitates towards worldwide data warehouse where different formats of information are shared. It can understand the actual meaning of a searching query rather than its HTML descriptions. This generation of the web offers immense connectivity options. Metadata of any information can be shared and acquired easily through semantic metadata. It offers an experience of a personalized web which analyzes the interests of its users and then responds accordingly. Three-dimensional (3D) environments are also a key component of web 3.0. This generation of the web also offers the facilities of the mobile web. It is understandable in any device, over a network.

The use of web 3.0 technology transforms the traditional role of internet infrastructure into a protagonist entity in content/process generation. The services of Web 3.0 can unite the

users and the computers for problem-solving and intensive knowledge creation tasks. It is understood that the advancement of web 3.0 revolutionizes the internet. Different organizations and academic institutes use the technology of web 3.0 for their business and academic & research purposes. Different institutions have gained the ability to provide efficient strategies through the use of integrated intelligent data. The institutions which are dedicated to education and research purposes are known as academic institutions. All the advanced higher education schools that grant degrees in graduation or postgraduation are examples of academic institutions. These institutions identify new resources of information. A library in an academic institute provides services to their students according to their academic needs. Internet is playing a massive role in library services. World Wide Web provides different features of the library to its users through a common user interface.

8.2 HISTORY OF WEB 2.0 AND WEB 3.0

Earlier the web allows users to search for information and read it, which was called web 1.0, there was very little user interaction and content contribution. Thus, due to this lack of common interaction with the users, there was the birth of web 2.0 which empowered the common users with new concepts like Blogs, Social-Media, wikis, folksonomies (“tagging” keywords on websites and links), video sharing sites (e.g., YouTube), image sharing sites (e.g., Flickr), hosted services, Web applications (“apps”), collaborative consumption platforms, and mash-up applications. Libraries also started using web 2.0 applications transforming themselves to Library 2.0 to deliver interactive services to their user communities which created a collaborative atmosphere between them. Library uses personalized OPAC that includes access to blogs, wikis, tags, RSS feeds, and public and private profiles within the library’s network. Thus, Libraries need to adapt to the newer version of Web 3.0 applications and transform themselves to Library 3.0 overtime for delivering modern updated library services to their user community; Besides, Library professional staff should also have to adopt new changes and start using web 3.0 applications like semantic web, cloud computing, Artificial Intelligence, 3D graphics and proper management of inguser-generated content or information to promote access of information anywhere anytime. Web 2.0 is a term coined in 1999 to describe websites that is the technology behind the static pages of earlier websites. The term is closely associated with Time O media web 2.0 conferences which were held in late 2004. Coined in 1999 by Darci DiNucci, and then attributed in 2004 to Dal Dougherty, a vice-president of O'Reilly Media Inc., the term Web 2.0 does not refer to an update of some technical specification, but a perceived second generation of Web-based communities and hosted services. In other words, it denotes a change in how software developers and end users are using the Web. Web 2.0 is a dynamic and fast-moving environment. One of the important implications is that Web 2.0 introduces a social network where people, organizations, or other social entities are

connected, add and edit information and share resources. Social networking sites, social bookmarking, blogs, wikis, and folk taxonomies “folksonomies” facilitate collaboration between users. Now web is semantic web, personalization, intelligent search and behavioural advertising among other things. It is a portable personal web focused on the individual life stream.

In the World Wide Web’s first decade (1990–2000), most of the development focused on the “back end,” that is, the infrastructure. Programmers created the protocols and code languages to make Web pages. During that time, the Web had static site applications and portals (brochure-ware) and was primarily a network of documents. Web 1.0 can be visualized as a library or a source of information.

In the second decade (2000–2010), the focus shifted to the “front end,” and the era of Web 2.0 began. Web 2.0 is a read-write Web; now people use its pages as platforms for other applications. Some consider that now, in the Web’s third decade (2010–2020), we are already at the end of the Web 2.0 cycle, with progression toward version 3.0 of the Web, which will make it simpler to index the contents, so information will be easier to understand. Web 3.0 will be the Web of data and knowledge.

Web 3.0 is the new paradigm shift of the World Wide Web. The term Web 3.0 was suggested by John Markoff in 2006 and refers to a generation of Internet-based services that might be called “the intelligent Web,” such as those using semantic Web technologies, microformats, natural language search, data mining, machine learning, recommendation agents, and artificial intelligence technologies, which emphasize machine-facilitated understanding of information to provide a more productive and intuitive user experience. The core idea of the Semantic Web is to create the meta-data describing data that will enable computers to process the meaning of things. Once computers are equipped with semantics, they will be capable of solving complex semantic optimization problems. A Web 3.0 search engine should not only find the keywords searched but also interpret the context of the request. Instead of multiple searches, people might type in a complex sentence and the Web 3.0 browser would then search the Internet for all possible answers, organize the results, and suggest other content related to the search terms. Some experts see Web 3.0 replacing the current Web, while others believe it will exist as a separate network. The next step (2020–2030) will be Web 4.0, with intelligent personal agents and intelligent machines.

8.3 DEFINITION OF WEB 1.0, WEB 2.0, AND WEB 3.0

Web 1.0: refers to the first stage of the World Wide Web. it is also known as the first generation of the web in which all the webpages were connected by hyperlinks. Web 1.0 was a set of static websites that were not yet providing interactive content. Rudman, (2010) defined web 1.0 as:

“Web 1.0 was a platform through which information could be published in a static form, well designed with text and images. It portrayed an environment where information and data were static and displayed with no interaction between the information and the consumer and minimal content creators, also known as the read-only Web”.

Web 2.0: is the second generation of the World Wide Web. It is an era of web where static web pages are moved to a more interactive and dynamic web experience. It focuses on the ability of people to share information online by using different social media, blogs, and other web-based applications. Rudman, (2010) defined web 2.0 as:

“The greater collaboration between consumers, programmers, service providers and organizations, which enabled them to re-use and contribute information, thereby enriching the content distributed between the collaborative parties on the Web”.

Web 3.0: is where the computer, rather than humans, generate new information. it has the capability of retrieving contextual information

while searching over the web. A most common definition of Web 3.0 given by Feng, (2009) is:

“Information in the website can be directly interacted with the related information of other Web, integrate and use information in many websites at the same time through the third information platform, users have their data on the Internet, and can be used on different websites, based entirely on the Web, it can realize the function that the complex system procedures have by using the browser”.

8.4 DIFFERENCES BETWEEN WEB 1.0, WEB 2.0 AND WEB 3.0

- **Web 1.0** generation was a read-only web which can only be used for information sharing. Web 1.0 connects information through the pushed web, text/graphics-based flash. In web 1.0, Content is published by the companies that people consume (e.g., CNN). The search engines of web 1.0 retrieve macro contents. These search engines enable to search with rapid fast speed but mostly they provide inaccurate, excessive results for their users. Web 1.0 consisted only of static content. It offers single-way publishing of content. It does not provide any interaction between readers or producers of the information. **Citeseer & Project Gutenberg are some popular digital library websites of the web 1.0 generation.**
- **Web 2.0** generation is a read and writes web which can be used for interaction among peoples Web 2.0 connects people through two-way web pages, videos, wikis, 2D portals and personal publishing Web 2.0 enables people to publish

their content that can be consumed by other people over the internet. Different companies provide platforms for people for publishing their content to other people (e.g., YouTube, Wikipedia, MySpace, RSS, Blogger, Digg etc.). The search engines of web 2.0 retrieve tags with micro contents. This tagging process is manual and covers a negligible percentage of the World Wide Web. The tags of Web 2.0 include news, events, links, Blogs, audio, video, pictures etc. It also retrieves micro content texts Web 2.0 offers the advanced experience of two-way communication among its users. It provides the facilities of social networking websites, wikis, blogging, tagging and user-generated videos.

Google Scholar & Book search are some examples of digital libraries of the web 2.0 generation.

- **Web 3.0** is a semantic web which enables the read, writing and execution of the web which involves a process of immersion Web 3.0 connects the knowledge through 3D portals, multi-user virtual environments (MUVEs) avatar representations, integrated games and different media that flows in and out of virtual web-worlds. Web 3.0 empowers its users to build applications through which other people can interact. Different companies provide a platform that enables the users to publish services (Google Maps, My Yahoo!). The search engines of the web 3.0 generation will hopefully retrieve micro content texts which were tagged automatically. It will be translating billions of macro contents of Web 1.0 into micro contents. These search engines will retrieve more precise results, as the function of tagging will decrease the ambiguous homonyms and synonyms from the process. Web 3.0 is an undefined emerging technology. It offers opportunities for all web learners for delivering a personalized web experience. **BRICKS, and Longwell are some examples of digital libraries of the web 3.0 generation.**

8.5 FEATURES OF WEB 2.0 AND WEB 3.0

Following are the salient features of Web 2.0:

- Write and Collaborative web
- a. Interactive Content
- b. JavaScript, Ajax, CSS and RSS etc
- c. Tagging and Folksonomy.
- d. Self-publishing platforms
- e. User as Contributor
- f. Social Networking.

Following are the salient features of Web 3.0:

- a. Read write and Executable Web
- b. Smart Applications
- c. User Behavior and Engagement
- d. RDF/ RDFS/ OWL
- e. Semantic Web
- f. The virtual 3D Web
- g. Artificial Intelligence

8.6 CHARACTERISTICS OF WEB 2.0 AND WEB 3.0

Following are the characteristics of web 2.0:

- a. The web is a platform. One can access it from installable software on a PC to software services that are accessible online. All data and software are now available in the online form.
- b. The web is functionality. The web aids in the transfer of information and services from websites.
- c. The web is simple to use and handle.
- d. It is social, flexible, mixable and participatory.

Following are the characteristics of web 3.0:

- a. Ubiquitous: It is available at anytime, anywhere, through any channel or device.
- b. Individualized: Web 3.0 is filtered and shared by friends or trusted by networks.
- c. Efficient: It is relevant and contextual information findable instantly.

8.7 WEB 2.0 AND WEB 3.0 APPLICATIONS IN LIBRARIES

The basic feature of the library is to provide information service to its users. The evolution of the web has enhanced the spirit of the services in the libraries. Web emerged in the libraries as a medium or platform to provide information services. Web 1.0 started as a read-only medium. Web 2.0 was established as a read-write medium. The technology infrastructure of Web 2.0 is complex, constantly in flux and really in a Renaissance mode. It includes server software, content syndication, messaging protocols, standards-based browsers, and various client applications. This is fundamentally about a transition of the website and e-mail-centric world from one that is mostly about information (and largely textual information) to one where the content is combined with functionality and targeted applications.

8.7.1 Web 2.0 application in libraries.

Web 2.0 could be seen as the web becoming a computing platform for serving up web applications to end users. It's primarily about a much higher level of interactivity and deeper user experiences which are enabled by the recent advances in web software combined with insights into the transformational aspects of the internet. Web 2.0 is ultimately about a social phenomenon not just about networked social experiences but about the distribution and creation of Web content itself, "characterized by open communication, decentralization of authority, freedom to share and re-use, and the market as a conversation." It moves the web experience into a place that more closely resembles an academic learning and collaboration environment than an information delivery and e-commerce vehicle. To enable this new world, we will see a more organized web with a plethora of new modalities of categorized content and more developed deep linking web architecture and a greater variety of web display modes like visualization. Ultimately this will result in another shift in the economic value of the web, potentially equaling that of the dot-com boom and, probably, driving an even higher level of social, political, institutional, and economic disruption. We better be ready. What is truly exciting is that Web 2.0 is just the title of a conversation. There is no standard (at least not just a single one). We can all participate and influence the development of the next generation of the web. To the detail-oriented this conversation may be too high in the stratosphere without enough concrete recommendations, and for the theoretically inclined it may remain too visionary for real implementation. Among all of us, it is worth following. Web 2.0 is probably the series title of the most important conversation of our age and one whose impacts can be truly transformational on a global scale.

Web 2.0 is about the more human aspects of interactivity. It's about conversations, interpersonal networking, personalization, and individualism. In the library world, this has relevance not just to our public web portals but also to workplace intranets and the imperative for greater social cohesiveness in virtual teams and global content engagement. Plain intranets and plain websites are fast becoming old stuff, just so last century. The emerging modern user needs the experience of the web, and not just content, to learn and succeed. We can already see some of these modalities emerging in the gaming environment. We see it clearly in the convergence of Web 2.0 type features and functions as they emerge in the high growth sites like MySpace, YouTube, Second Life, Active Worlds, Facebook, Meebo, et al. Context is the word of the day here.

Such technologies as are listed below serve as the emerging foundation for Web 2.0:

- RSS (really simple syndication)
- Wikis
- New, simple and revised programming methods like AJAX, J2EE, widgets,
- gadgets, Mashups, and APIs
- Blogs and blogging

- Advanced portals and portlets
- Commentary and comments functionality – everywhere
- Personalization and “My Profile” features
- Personal media such as Podcasting and MP3 files
- Streaming media audio and video formats
- Reviews and user-driven ratings
- Personalized Alerts
- Web Services for enhancement and data mining
- Instant messaging and virtual reference including co-browsing
- Folksonomies, tagging and tag clouds
- Photos (e.g., Flickr, Picasa)
- Social networking software
- Open Access, Open Source, Open Content
- Socially driven content
- Social bookmarking (such as del.icio.us)

8.7.2 Web 3.0 application in libraries

Web 3.0 evolving as a technologically advanced medium which allows reading, writing and execution with artificial intelligence. Web 3.0 in the library services can be seen as a portable personal web that focuses on the individuals, Lifestream, consolidating dynamic contents and organized information services. Application of converted the libraries into Library 3.0 i.e., ‘libraries using technologies such as the semantic web, cloud computing, and mobile devices and re-envisioning our use of established technologies such as federated search to facilitate user-generated content and collaboration to promote and make library collections accessible. With Library 3.0, library services are frequently updated and evaluated to meet the emerging needs of library users. With web 3.0, library services can be offered across borders i.e., services can be made available regardless of the physical location of the user.

Following are some common applications of web 3.0 in the libraries.

1. **Web-OPAC:** With the availability of a catalogue on the internet users can access it from anywhere around the globe. With the use of technologies, information is made available to search and access.

2. **Ontology:** It is a web 3.0 technique used in the libraries for the interpretation of information of the web content and expressing its semantics in a machine-readable manner. An ‘ontology deals with questions concerning what entities exist or can be said to exist and how such entities can be grouped, related within a hierarchy and subdivided according to similarities and differences.
3. **Virtual reference service:** Web 3.0 is used to provide virtual reference service to those users which away from the library. Various applications like Mobile OPAC etc. are used for virtual reference service.
4. **Ubiquitous Contents:** Some types of content are frequently used at a particular time or within a group of users. Ubiquitous contents deal with such frequently used contents and their storage, retrieval, mode of share, transfer etc.
5. **Geo Tagging:** This is a technique to locate the specific location of a piece of information.

Apart from this as mentioned above web 3.0 is also used in libraries to provide awareness services according to the interest of the users, alerts about the latest arrival etc. In some technologically advanced libraries, web 3.0-based applications are used for dissemination of information, locating the latest arrivals, delivery of documents etc. Libraries now used to apply semantic web in the digital preservation of some rare documents like manuscripts, organising the information and making the contents globally accessible. We can say that web 3.0 made a tremendous revolution in the field of library and information services.

8.8 LIBRARY 2.0

In the library and information professional world, we generally deal with a savvier audience of users relative to the general consumer. We also tend to the digital divide issues of the more challenged user. This means that what our most critical users don’t know about or use, we can often inform them of, and train them in the newest technologies that can have an impact on their success. For those users who can quickly become comfortable using technologies such as wikis, RSS, instant messaging, news aggregators and blogs, we can help them to leverage these in making a difference in reaching their goals and your institutional or enterprise goals. For those libraries that block access to the newest applications, they are positioning their technological presence as one which is poor. This is not a good position to take as a bridge in the digital divide for their communities.

Library 2.0 is another ‘conversation’. This narrative is mainly around the concept of how to use the Web 2.0 opportunities in a library environment. It’s an exciting concept and one which can create a conversation that creates the next generation of library websites, databases, OPACs, intranets and portals in a way that allows the end user to thrive and survive (and libraries along with them!). It’s also about having a conversation about some of the human aspects of this emerging environment. Here is a question which needs to be answered, are we entering an era where the user experience for learning and research will finally top the technology? very one of the technologies listed in Web 2.0 above RSS, wikis, logging, personalization, podcasting, streaming media, ratings, alerts, folksonomies, tagging, social networking software and the rest could be useful in an enterprise, institutional research or community environment and could be driven or introduced by the library.

The beauty of Web 2.0 and Library 2.0 is the level of integration and interoperability that is designed into the interface through your portal or intranet. That’s where the real power to enhance the user experience is to take advantage of the concepts inherent in Library 2.0 it is imperative to not shy away from adding advanced functionality and features directly into the content. This would provide the context and workflow-oriented features that users will demand or are demanding already. We’re seeing the beachfront on this trend in services like Second Life Library 2.0, MySpace and Facebook.

8.9 LIBRARIAN 2.0

We cannot have these changes without some improvements in the capacity, competencies, aptitudes and attitudes of library workers. Librarians have a once-in-a-generation opportunity to invent a new future. Librarian 2.0 is the guru of the information age. Librarian 2.0 strives for the following:

- Understand the power of Web 2.0 opportunities.
- Learn the major tools of Web 2.0 and Library 2.0.
- Combine e-resources and print formats seamlessly
- Be container and format agnostic.
- Be device independent and use and deliver to everything from laptops to PDAs to iPods.
- Develop targeted federated searches and adopt the Open URL standard.
- Connect people and technology and information in context.

- Not shy away from non-traditional cataloguing and classification and choose tagging, tag clouds, folksonomies and user-driven content descriptions and classifications where appropriate.
- Embrace non-textual information and the power of pictures, moving images, sight and sound.
- Understand the ‘long tail’ and leverage the power of old and new content.
- See the potential in using content sources like the Open Content Alliance,
- Google Book Search and Open World Cat.
- Connect users up to expert discussions, conversations and communities of practice and participate there as well.
- Use the latest tools of communication (such as Skype) to connect content, expertise, information coaching and people.
- Use and develop advanced social networks to enterprise advantage.
- Connect with everyone using their communication mode of choice – telephone, Skype, IM, SMS, texting, e-mail, virtual reference, etc.
- Encourage user-driven metadata and user-developed content and commentary.
- Mine their usage data for insights into user behaviours.
- Understand the wisdom of crowds and the emerging roles and impacts of the blogosphere, web syndicasphere and wikisphere.

First and foremost, Librarian 2.0 understands users at a deep level not just as pointers and clickers. Librarian 2.0 understands end-users deeply in terms of their goals and aspirations, workflows, social and content needs, and more. Librarian 2.0 is where the user is when the user is there. This is an immersion environment that librarians are eminently qualified to contribute. Aspects of librarian-influenced e-learning and distance education as implemented by our institutions and communities should allow us to contribute to the preparation of our users to acquire and improve their skills and competencies. We must start preparing to become Librarians 2.0 now. The web 2.0 movement is laying the groundwork for exponential business growth and another major shift in the way our users live, work and play. We have the ability, insight and knowledge to influence the creation of this new dynamic and guarantee the future of our profession, Librarian 2.0 now and beyond.

8.10 CONCLUSION

Ever since the invention of the Web in 1989 by Tim Berners-Lee, it continued to develop and Web 3.0 is another step in this process. Web 2.0 is very helpful for employees in organizations to learn, interact and communicate fast. The tools of Web 2.0 allow people to chat online, share thoughts using blogs and also to share videos. The main purpose of Web 3.0 is to extend the ability of the application to maximize the benefits obtained from resources available from the WWW community with the help of linked data, devices and people across the Web. In a Web 3.0 world, the Internet will be different to the users as the content and applications can easily accessed at their, thus breaking away from the traditional format.

Librarians are perfectly compatible with the new tools of Web 2.0 and with the arrival of Web 3.0 and the Semantic Web. They have all the necessary qualifications and basic skills to play an active part in this progression. Their expertise in alerting, tagging, cataloguing, customizing information, and judging and selecting information sources will be a passe-partout to follow the evolution of the Web and users' needs. Librarians can and must follow the continuous progression of the Web generations; they must view them as new opportunities, not as something they need to be afraid of getting involved in. They need to keep an eye open for emerging trends and changes in users' expectations and determine how they can meet those expectations. They also need to work together to share ideas and experiences, implement developments, and learn from each other. Of course, they can rise to the challenge of the latest "Web era" it is just a question of re-casting themselves yet again!

In the present era of information exploration and technology, Web 3.0 brings a revolutionary change to the field of information science. Providing the right information to the right hand at the right time is became a prime objective of the information service providers. Accordingly, busy user also tries to acquire definite information which fulfils their requirement. Web 3.0 can help to upgrade library services. It can save time and services can be provided to the optimum level. Information can be acquired or can be delivered to anyone from anywhere at any time. Parent authorities should emphasize making their libraries well equipped with web 3.0 applications with properly trained staff. Other library professionals and users are also expected to carry the required technological knowledge to take the benefits of web 3.0.

8.11 SELF-ASSESSMENT QUESTIONS

1. Define web 1.0, web 2.0 and web 3.0, and also highlight the historical background of these technologies.
2. Elaborate on the difference between web 1.0, web 2.0 and web 3.0.
3. Describe salient features and characteristics of web 2.0 and web 3.0.
4. Explain with examples the application of web 2.0 and web 3.0 technologies application in libraries.
5. Elaborate on the concept of library 2.0 and librarian 2.0.

ACTIVITY:

1. Prepare a chart of services provided by university libraries using web 2.0 and web 3.0 technologies.

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Unit-9

INTERNET OF THINGS FOR LIBRARIES AND CONTENT MANAGEMENT SYSTEM

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INTRODUCTION

The unit is specifically designed to discuss the emerging technology “Internet of Things”. What IoT is and its historical background, how it works, and its importance and benefits are the main parts of the unit. The use of IoT in libraries and its impact on library services is also elaborated in the unit.

OBJECTIVES

After studying this unit, you will be able to explain:

1. What is IoT?
2. What are the benefits and technologies used in IoT?
3. How do IoT work, and its importance?
4. What is the history of IoT and how this concept is used in libraries to formulate various services?
5. The impact of IoT on libraries.

9.1 INTRODUCTION

Today, Internet has occupied a distinctive position in various spheres of human life. Its growth is spearheaded by mobile devices, which have increasingly become part of modern living as everyone wishes to be connected to the Internet all the time. This has become possible owing to the increasing availability of broadband Internet connection at a reduced cost, availability of more devices with Wi-Fi capabilities, technology affordability at lower cost and high penetration of smartphones. The technological developments have made it possible for us to access a plethora of services such as finding information, shopping, booking tickets, navigating through maps and communicating over email, social media and mobile apps. This all resulted in the Internet for communication and accessing certain services over devices. But the next revolution, where in Internet, like mobile phones are going to occupy a ubiquitous position in our lives as it starts connecting things in the physical world and this is expected to have a big impact on the way we live.

As the world becomes more connected through the communication devices we use, as well as the common household items and systems that theoretically make our lives less stressful, there is an increased acknowledgement that this interconnected environment has entered the next phase of potential unlimited possibilities through what is commonly referred to as the Internet of Things (IoT). Internet of Things (IoT) is connecting any object, which may include everything from cell phones, coffee makers, cars, washing machines, air conditioners, lamps, wearable devices and almost anything else one can think of. The objects, using sensors and having networking capabilities would be able to communicate with each other, access Internet services and interact with people. The objects or things in the Internet of things could be a person or an animal or a physical object such as a car. A heart monitor implant installed in the human body could be able to send messages to doctors to define the state of health of a person to avoid any emergency hospitalization and a car having built-in sensors in its tires could be able to alert the driver about low or high pressures to avoid any possible accidents.

This new paradigm is bound to impact business models, consumer experiences and everyday life. It is bringing in new opportunities but also risks privacy and security of data, managing which is going to be a challenge. However, the supporters of IoT argue that, when technology evolves, it brings in opportunities, threats and solutions. When the Internet for communications happened, privacy was breached in certain areas, but technology some time provided solutions to control such intrusions. Similarly, it is the technology, which might provide solutions to protect personal data by individuals themselves as IoT is different from the web and concentrates more on individual behaviors and actions.

Consequently, it is chilling to some who have suggested that the IOT brings with it advances wherein we must also become more aware and on-guard about our privacy and security as a result of the increased numbers of devices we use every day in our homes and workplaces that are often interconnected using the internet as its medium of communication. Over the past few years, IoT has become one of the most important technologies of the 21st century. Now that we can connect everyday objects—kitchen appliances, cars, thermostats, baby monitors—to the internet via embedded devices, seamless communication is possible between people, processes, and things.

9.1.1 What is the Internet of Things?

According to Techopedia¹ “The Internet of Things is a computing concept that describes a future where every day physical objects will be connected to the Internet and be able to identify themselves to other devices”. “The Internet of Things is a scenario in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS) and the Internet”. In simple terms, the Internet of things enables, any natural or man-made objects to communicate with each other and transfer data using assigned IP addresses with or without human interventions. As with any new thing, different people coined different names for IoT. Some of the names are smart devices, ubiquitous or pervasive computing devices, machine-to-machine communication and so on.

9.1.2 How does IoT work?

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices -- for instance, to set them up, give them instructions or access the data. The connectivity, networking and communication protocols used with these web-enabled devices largely depend on the specific IoT applications deployed. IoT can also make use of artificial intelligence (AI) and machine learning to aid in making data collecting processes easier and more dynamic.

9.1.3 Why is IoT important?

The internet of things helps people live and work smarter, as well as gain complete control over their lives. In addition to offering smart devices to automate homes, IoT is essential to business. IoT provides businesses with a real-time look into how their systems work, delivering insights into everything from the performance of machines to supply chain and

logistics operations. IoT enables companies to automate processes and reduce labour costs. It also cuts down on waste and improves service delivery, making it less expensive to manufacture and deliver goods, as well as offering transparency into customer transactions. As such, IoT is one of the most important technologies of everyday life, and it will continue to pick up steam as more businesses realize the potential of connected devices to keep them competitive.

9.1.4 What are the benefits of IoT to organizations?

The internet of things offers several benefits to organizations. Some benefits are industry-specific, and some are applicable across multiple industries. Some of the common benefits of IoT enable businesses are as follows:

- monitor their overall business processes.
- improve the customer experience (CX).
- save time and money.
- enhance employee productivity.
- integrate and adapt business models.
- make better business decisions; and
- generate more revenue.

IoT encourages companies to rethink the ways they approach their businesses and gives them the tools to improve their business strategies. Generally, IoT is most abundant in manufacturing, transportation and utility organizations, making use of sensors and other IoT devices; however, it has also found use cases for organizations within the agriculture, infrastructure and home automation industries, leading some organizations toward digital transformation. IoT can benefit farmers in agriculture by making their job easier. Sensors can collect data on rainfall, humidity, temperature and soil content, as well as other factors, that would help automate farming techniques.

The ability to monitor operations surrounding infrastructure is also a factor that IoT can help with. Sensors, for example, could be used to monitor events or changes within structural buildings, bridges and other infrastructure. This brings benefits with it, such as cost saving, saved time, quality-of-life workflow changes and paperless workflow. A home automation business can utilize IoT to monitor and manipulate mechanical and electrical systems in a building. On a broader scale, smart cities can help citizens reduce waste and energy consumption. IoT touches every industry, including businesses within healthcare, finance, retail and manufacturing.

9.1.5 What are the pros and cons of IoT?

Some of the advantages of IoT include the following:

- ability to access information from anywhere at any time on any device.

- improved communication between connected electronic devices.
- transferring data packets over a connected network saving time and money; and
- automating tasks helping to improve the quality of a business's services and reducing the need for human intervention.

Some disadvantages of IoT include the following:

- As the number of connected devices increases and more information is shared between devices, the potential that a hacker could steal confidential information also increases.
- Enterprises may eventually have to deal with massive numbers -- maybe even millions -- of IoT devices and collecting and managing the data from all those devices will be challenging.
- If there's a bug in the system, every connected device will likely become corrupted.
- Since there's no international standard of compatibility for IoT, it's difficult for devices from different manufacturers to communicate with each other.

9.2 HISTORY OF IOT?

The concept of the Internet of Things (IoT) was initially raised by Kevin Ashton in the early 2000s while working on a project for Proctor and Gamble to improve their supply chain management by linking RFID data to the Internet. In January 2000 LG announced plans for the first Internet-connected refrigerator. IoT has evolved from the convergence of wireless technologies, microelectromechanical systems (MEMSes), microservices and the internet. The convergence has helped tear down the silos between operational technology (OT) and information technology (IT), enabling unstructured machine-generated data to be analyzed for insights to drive improvements.

Although Ashton's was the first mention of the internet of things, the idea of connected devices has been around since the 1970s, under the monikers *embedded internet* and *pervasive computing*. The first internet appliance, for example, was a Coke machine at Carnegie Mellon University in the early 1980s. Using the web, programmers could check the status of the machine and determine whether there would be a cold drink awaiting them, should they decide to make the trip to the machine.

IoT evolved from M2M communication, i.e., machines connecting via a network without human interaction. M2M refers to connecting a device to the cloud, managing it and

collecting data. Taking M2M to the next level, IoT is a sensor network of billions of smart devices that connect people, systems and other applications to collect and share data. As its foundation, M2M offers the connectivity that enables IoT.

The internet of things is also a natural extension of supervisory control and data acquisition (SCADA), a category of software application programs for process control, the gathering of data in real-time from remote locations to control equipment and conditions. SCADA systems include hardware and software components. The hardware gathers and feeds data into a computer that has SCADA software installed, where it is then processed and presented promptly. The evolution of SCADA is such that late-generation SCADA systems developed into first-generation IoT systems. In 2005, International Telecommunications Union (ITU) took cognizance of the development and mentioned about 'Internet of things' in a published International Telecommunications Union report. In 2008, the IPSO alliance was formed to promote the use of Internet Protocol (IP) networked devices in energy, consumer, healthcare and industrial applications.

The concept of the IoT ecosystem, however, didn't come into its own until the middle of 2010 when, in part, the government of China said it would make IoT a strategic priority in its five-year plan. In 2012 IPv6 (Internet Protocol version 6) was launched which made it possible to assign an IP address to every atom on this earth without having any constraints, thus ensuring connectivity between and across millions of devices.

The growth forecast for the Internet of Things is very high as the objects connected to the Internet is rising year after year. Even though the concept emerged in the early 2000s, a sudden surge of interest in IoT has happened owing to multiple factors viz., the introduction of a new version of Internet protocol i.e., IPv6, support of major network providers (Cisco, IBM, GE and Amazon) and decreasing connectivity costs. GE estimates that the 'Industrial Internet has the potential to add \$10 to \$15 trillion to global GDP in the next 20 years. Cisco's Internet Business Solutions Group (IBSG) predicts some 25 billion devices will be connected by 2015, and 50 billion by 2029. According to a BI Intelligence report, it has been predicted that, by 2019, IoT will be the largest devices market in the world.

9.3 THE FUTURE OF THE INTERNET OF THINGS

One day, the internet of things will become the internet of *everything*. The objects in our world might sense and react to us individually all the time so a smart thermostat automatically adjusts based on your body temperature or the house automatically locks itself when you get into bed. Your clothes might come with connected sensors, too, so that the things around you can respond to your movements in real-time. That's already

starting to happen: In 2017, Google announced Project Jacquard, an effort to create the connected wardrobe of the future.

In 2018, there were 23 billion connected devices, according to market data from Statista. By 2025, forecasters believe there will be more than 75 billion. Part of that explosion comes from people getting more comfortable with an always-on, data-collecting device that sits in their living room. But it also comes from product-makers dreaming up new things to connect to the internet. This vision extends far beyond your home, and even your clothes. You'll also have smart offices, smart buildings, and smart cities. Smart hospital rooms will have sensors to ensure that doctors wash their hands, and airborne sensors will help cities predict mudslides and other natural disasters. Autonomous vehicles will connect to the internet and drive along roads studded with sensors, and governments will manage the demands on their energy grids by tracking household energy consumption through the internet of things. The growth of the internet of things could also lead to new kinds of cyberwarfare; imagine a bad actor disabling every smart thermostat in the dead of winter or hacking into internet-connected pacemakers and insulin pumps. It could create new class systems: those with robot maids, and those without. Or, as Ray Bradbury described in one short story from 1950, all the people might disappear—but the smart homes, preparing meals and sweeping the floors, will live on.

If we're going to get there whether we like "there" or not, we are going to need faster internet. Enter: 5G. Crazy-fast internet speeds have long been overpromised and undelivered, but these days, you can see real 5G if you squint. In 2020, as the coronavirus pandemic sent daily work and life into cyberspace, the FCC accelerated its timeline for improving existing internet infrastructure. That could have happy consequences for remote work and school but might also speed up the possibilities for other internet-enabled devices. China, which is much closer to adopting the 5G standard nationwide, has this year begun testing things like 5G-powered robots in hospital wards to protect doctors from contagious diseases, like the novel coronavirus. Even without 5G, the internet of things supported health care this year. Researchers used the GPS in mobile phones to track the spread of the virus, public health workers used sensors to monitor patients under quarantine, and doctors used internet-connected devices, like drones and robots, to deliver drugs and check on patients without risking contact.

We'll also need to keep all those devices from mucking up the airwaves, and we'll need to find a better way to secure the data that's transmitted across those airwaves. Recently, the Swiss cryptography firm Teserakt introduced an idea for a cryptographic implant for IoT devices, which would protect the data that streams from these devices. And Darpa—that's the Department of Defense's innovation arm—is also working on buffing up the security technology for the military's various IoT devices. That effort, delightfully

named CHARIOT (Cryptography for Hyper-scale Architectures in a Robust Internet of Things), aims to prototype many low-cost cryptography techniques to make internet-enabled devices harder to hack into. Darpa's inventions aren't just for the military: Drones, GPS, autonomous vehicles, and the actual worldwide web all came out of the agency's research projects. So, if the agency can crack IoT security well enough for the military, it's likely to help your humble HomePod, too.

There are also ideas for creating a better standard for IoT devices and plans to help them get along with each other, regardless of which company makes them or which voice assistant lives inside. However, the internet of things changes the future, first, they just need to work.

9.4 THE IOT AND LIBRARIES

Libraries are uniquely positioned to take advantage of the Internet of Things technologies. Not only can many of these things be integrated into the physical space of the library, but librarians can act as local experts to help their patrons understand these new devices and integrate them into their lives. A recent survey conducted by OCLC found that many librarians had at least a passing familiarity with IoT technologies, and survey respondents listed several ways these new tools could be integrated into the library. The following examples includes:

- inventory control
- mobile payments, ticketing, and event registration
- climate and room configuration, accessibility, and wayfinding
- mobile reference
- resource availability for both content and physical plant (rooms, AV equipment).

One currently available IoT device that could be of interest to libraries is called a Beacon. A combination of a smartphone app and a transmitter beacon provides location-specific information and updates tailored to individual patrons. Libraries can use these beacons to provide event announcements, wayfinding, and item recommendations. The IoT should also be of particular interest to medical librarians. Many of the devices currently in development are related to medicine, from assisted living activity sensors to smart pill bottles that remind patients when to take their medications.

9.5 IOT IMPACT ON LIBRARIES

Even though IoT is still in its infancy, it has a huge potential for libraries. Libraries will be able to add more value addition to their services and offer a rich library experience for

patrons. IoT is all about connecting objects to online as they are uniquely identifiable. Librarians are already familiar with this in libraries owing to the use of RFID, which does the similar thing of interacting with machines, tags and updating the library management system with entries of books issued to a user, but in the case of IoT, only the difference is, it is the Internet interacting with a thing or object such as a book. Libraries have books, journals, CDs/DVDs, these and many more physical objects and IoT can be a blessing in disguise to overcome some of the perennial library problems such as misplacement of objects and their usage.

It can even help in strengthening the ties between the books and readers thereby realizing Dr S.R. Ranganathan's 2nd law of library science "Every Reader his or her Book." Since most of the patrons in present days have smartphones, using a mobile app, libraries can enable them to access and use library resources through a virtual library card. It has great potential for libraries to market their services.

Some of the potential areas for implementation of IoT in libraries include the following:

9.5.1 Access to library and its resources

Libraries, using a mobile app, may provide a virtual library card to their members, which will enable members to gain access to the library and use its resources. When a user accesses the library catalogue to locate the required resource/s, the library app stored on his or her mobile will provide a map of the library guiding the user to the location of resource/s. It can also provide additional information about a resource by connecting to a site such as Amazon, so that the user has detailed information about a resource before he/she borrows it.

9.5.2 Collection management

The library collection having RFID tags on each of the items enables their virtual representation, which can be identified using computers and RFID readers. Through the integration of RFID tags into member cards, circulation of items and fine collection can be streamlined. The IoT will be able to tell users about overdue books and how much fine they owe to the library, to enable them to return the overdue books and pay the fine online without needing to stand in a queue at the library circulation desk. Smart digital shelves may be able to promote the content based on patrons borrowing records and search history on the Internet. IoT will also help in better inventory management (stock verification) as it will be easy to locate misplaced books.

9.5.3 Information literacy

Information literacy or orientation is offered to new patrons to educate them about a library, its resources and services. IoT may help libraries by providing a self-guided virtual tour of the library. Libraries had set up beacons like wireless devices at various sections of the library, when users visit a particular section, their mobile phone will play a video or audio explaining more about that section and how one can get the maximum benefit out of it. It may even be able to provide the enriched experience of special collections such as manuscripts by providing the digital format of it on their mobile phones as physical access to such resources is restricted.

9.5.4 Recommendation service

IoT can use patron's data to suggest tailored recommendations, using real-time data, based on the history of their borrowings. When a researcher searches a database for resources on the topic of his or her research, it will be possible to suggest other resources, which would be of interest to them. Even when a user, while visiting the library next time or is he or she is close to the library, IoT would be able to inform the user about new arrivals in his or her area of work or about the availability of the borrowed book, which he or she was looking for during his/her earlier visit.

9.5.5 Location-based services

IoT would help libraries in providing location-based services. If a user has created his favourite list in the library catalogue using his or her account from home or office, walking into the library with IoT enabled mobile device, would be able to get directions for stacks, where favourite books have been shelved and also would be able to help him or her to know interesting titles available on the topic and status of checked out books. It may also enable libraries to provide the status of availability of reading rooms, discussion rooms, printers, scanners, computers etc, by displaying the peak and non-peak hours of their usage on the library website or users can check it using their library mobile app.

9.5.6 Appliances management

IoT may help libraries and their users in better management of available appliances thus saving energy costs. Even though some of such things are in place in some libraries, they may extend the control not only to library staff but also to users. Imagine, a user walking into a library, using a cubicle or reading table using their IoT-enabled mobile phones would be able to control the lighting, air conditioning, Wi-Fi etc.

9.6 FUTURE OF IOT IN LIBRARIES

The future of IoT in libraries seems to be robust looking into the developments in this sector. IoT once fully evolved, may bring a sea change in the way how libraries function and provide services to their patrons. It may turn library buildings into smart buildings, wherein patrons can interact with various things in the library and get virtually all kinds of information using devices having communication capabilities. Over the years, apart from the possible areas of implementation mentioned above, IoT may enter deeper into various areas of libraries and may be able to give statistics on usage of library resources, a map indicating areas of the library most used, satisfaction level of users' experience and when students get frustrated with library resources and resort back to Google.

Libraries need to take into consideration various issues before jumping on the bandwagon of IoT. First is the privacy and security of the patron's data as there is a possibility of sharing this data with third parties, which may lead to hacking. Secondly, the cost of investment in IoT technologies in terms of money, manpower and time. Thirdly, staff training and finally the most important thing is a decline in the use of the physical library. Libraries by taking their patrons into confidence, informing them about the privacy and security of data and providing the required training and infrastructure would be able to implement IoT to enrich their services and patron's library experiences.

9.7 CONCLUSION

The Internet of Things is an exciting concept that has only begun to be implemented. As more "smart" devices are developed, there will be many new ways for users to interact with their environment and each other.

Although there are currently no clear standards and no "killer app" for IoT yet, librarians should be aware that this technology is coming. There are several problems that need to be dealt with, including privacy and security concerns, but the Internet of Things could fundamentally change the way people interact with their environment, their devices, and each other.

IoT has a great potential for libraries. If implemented in the desired lines, may bring in desired results and make value addition to library resources and services. It is still in evolving stage, and it makes sense for librarians to learn about this new technology and wait until the technology is more widely accepted, adopted and available for better implementation in libraries. At the same time, it would be also interesting to learn from early adopters and devise better ways to maximize the benefit of IoT adoption in libraries.

Libraries are prone to change, and it has been witnessed throughout history, hence IoT would be the next big thing after the Internet, which is going to bring in a plethora of changes to the library arena, particularly the way library connects and communicates with its patrons.

9.8 SELF-ASSESSMENT QUESTIONS

1. Define IoT and discuss its importance and benefits to society.
2. Explain the impact of IoT on libraries and the history of IoT.
3. What is the future of IoT in libraries and society?
4. How does IoT work, explain with examples.

ACTIVITY:

1. Prepare an IoT-based model of public library services to users.

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